DEVELOPING A STATE WATER PLAN

GROUND–WATER CONDITIONS IN UTAH, SPRING OF 1979

by

Don Price and others

United States Geological Survey

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Most values are given in this report in inch-pound units followed by metric units in parentheses. The conversion factors used are shown to four significant figures. However, in the text the metric equivalents are shown only to the number of significant figures consistent with the accuracy of the value in inch-pound units.

Inch-pound			Metric	
Unit (Multiply)	Abbreviation	(by)	Unit (to obtain)	Abbreviation
Acre-foot	acre-ft	0.001233	Cubic hectometer	hm^3
Foot	ft	.3048	Meter	m
Inch	in.	25.40	Millimeter	mm
Mile	mi	1.609	Kilometer	km

Chemical concentration is given only in metric units--milligrams per liter (mg/L). For concentrations less than 7,000 mg/L, the numerical value is about the same as for concentrations in the inch-pound unit, parts per million.

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INTRODUCTION

This report is the sixteenth in a series of annual reports that describe ground-water conditions in Utah. Reports in the series, prepared cooperatively by the U.S. Geological Survey and the Utah Division of Water Resources, provide data to enable interested parties to keep abreast of changing ground-water conditions.

This report, like the others in the series, contains information on well construction, ground-water withdrawals, water-level changes, and related changes in precipitation and streamflow. Supplementary data such as graphs showing chemical quality of water and maps showing water-table configuration are included in reports of this series only for those years or areas for which applicable data are available and are important to a discussion of changing ground-water conditions.

The report includes individual discussions of selected major areas of ground-water withdrawal in the State for the calendar year 1978. Water-level fluctuations, however, are described for the period spring 1978 to spring 1979. Much of the data used in the report were collected by the Geological Survey in cooperation with the Division of Water Rights, Utah Department of Natural Resources.

The following reports dealing with ground water in the State were released by the Geological Survey during 1978.

Hydrologic reconnaissance of the Fish Springs Flat area, Tooele, Juab, and Millard Counties, Utah, by E. L. Bolke and C. T. Sumsion, Utah Department of Natural Resources Technical Publication 64.

Aquifer tests of the Navajo Sandstone near Caineville, Wayne County, Utah, by J. W. Hood and T. W. Danielson, Utah Department of Natural Resources Technical Publication 66 (in press).

UTAH'S GROUND–WATER RESERVOIRS

Small quantities of ground water can be obtained from wells throughout much of Utah, but large supplies that are of suitable chemical quality for irrigation, public supply, or industrial use generally can be obtained only in specific areas. The major areas of ground-water development discussed in this report are shown in figure 1 and named in table 1. Only a few wells outside of these areas yield large supplies of water of good chemical quality for the uses listed above, although some of the basins in western Utah and many areas in eastern Utah have not been explored sufficiently to determine their potential for ground-water development.

About 2 percent of the wells in Utah obtain water from consolidated rocks. The consolidated rocks that yield the most water are lava flows, such as basalt, which contain interconnected vesicular openings or fractures; limestone, which contains fractures or other openings enlarged by solution; and sandstone, which contains interconnected openings between the grains that form the rock and may also contain open fractures. Most of the wells that tap consolidated rocks are in the eastern and sourthern parts of the State in areas where water supplies cannot be obtained readily from unconsolidated rocks.

About 98 percent of the wells in Utah draw water from unconsolidated rocks. These rocks may consist of boulders, gravel, sand, silt, or clay, or a mixture of some or all of these sizes. Wells obtain the largest yields from the coarser materials that are sorted into deposits of uniform grain size. Most wells that tap unconsolidated rocks are in large intermountain basins, which have been partly filled with debris from the adjacent mountains.

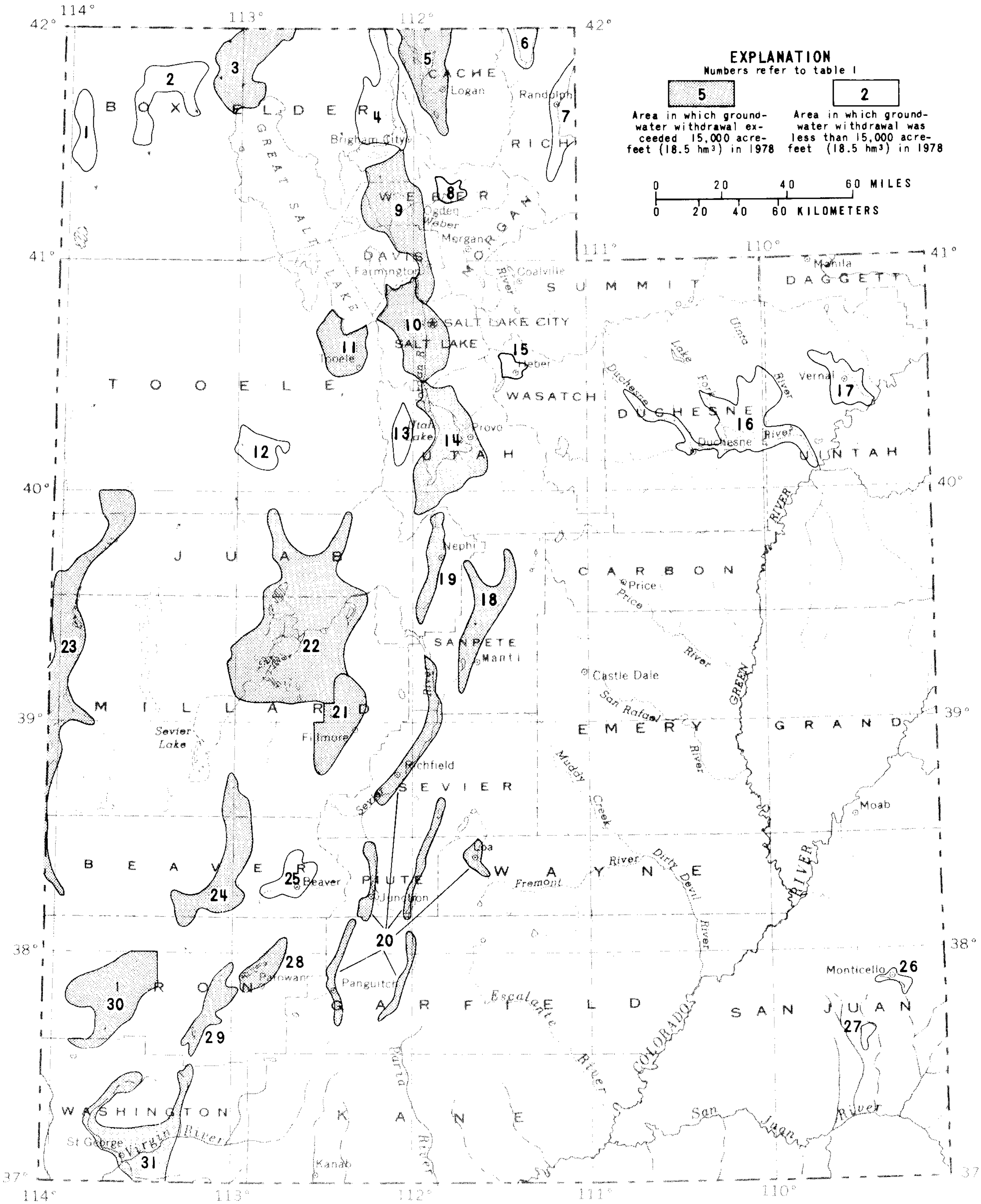

Figure 1.—Areas of ground-water development specifically referred to in this report.

Table 1.—Areas of ground-water development specifically referred to in this report

Number in figure 1	Area	Principal type of water-bearing rocks
1	Grouse Creek valley	Unconsolidated
2	Park Valley	Do.
3	Curlew Valley	Unconsolidated and consolidated
4	Malad-lower Bear River valley	Unconsolidated
5	Cache Valley	Do.
6	Bear Lake valley	Do.
7	Upper Bear River valley	Do.
8	Ogden Valley	Do.
9	East Shore area	Do.
10	Jordan Valley	Do.
11	Tooele Valley	Do.
12	Dugway area	Do.
13	Cedar Valley	Do.
14	Utah and Goshen Valleys	Do.
15	Heber Valley	Do.
16	Duchesne River area	Unconsolidated and consolidated
17	Vernal area	Do.
18	Sanpete Valley	Unconsolidated
19	Juab Valley	Do.
20	Central Sevier Valley	Do.
	Upper Sevier Valleys	Do.
	Upper Fremont River valley	Unconsolidated and consolidated
21	Pavant Valley	Unconsolidated
22	Sevier Desert	Do.
23	Snake Valley	Do.
24	Milford area	Do.
25	Beaver Valley	Do.
26	Monticello area	Do.
27	Blanding area	Do.
28	Parowan Valley	Unconsolidated and consolidated
29	Cedar City Valley	Unconsolidated
30	Beryl-Enterprise area	Do.
31	Central Virgin River area	Unconsolidated and consolidated

SUMMARY OF CONDITIONS

The estimated total withdrawal of water from wells in Utah in 1978 was about 829,000 acre-feet (1,022 hm^3) --about 118,000 acre-feet (145 hm^3), or 12 percent, less than in 1977 and only 62,000 acre-feet (76 hm^3), or about 7 percent, more than the average annual withdrawal during 1968-77 (table 2). The decrease in withdrawals from the amount reported for 1977 was due primarily to decreases in withdrawals for irrigation.

Total withdrawal for irrigation in 1978 was about 562,000 acre-feet (693 hm^3) (table 2), which is about 114,000 acre-feet (141 hm^3) less than in 1977. The only areas in which withdrawals for irrigation in 1978 exceeded the amounts reported for 1977 were Grouse Creek, Tooele, and Cedar Valleys and the central Virgin River area (fig. 1, areas 1, 11, 13, and 31).

The quantities of water withdrawn from wells for irrigation are closely related to local climatic conditions. Precipitation in 1978 was above average in most of Utah (National Oceanic and Atmospheric Administration, 1979).

Table 2.—Well construction and withdrawal of water from wells in Utah

Area	Number in figure 1	Number of wells completed in 1978[1]: Diameter: Less than 6 inches	Diameter: 6 inches or more	Large-withdrawal wells[2]	Estimated withdrawal from wells (acre-feet): 1978: Irrigation	1978: Industry	1978: Public supply	1978: Domestic and stock	1978: Total (rounded)	1977 total[3]	1968-77 average annual[4]
Cache Valley	5	43	52	10	11,700	9,700[5]	2,600	2,100	26,000	32,000	25,000
East Shore area	9	35	8	1	15,700[6]	5,900	18,100	–	40,000	52,000	43,000
Jordan Valley	10	9	105	17	3,800	41,900[7]	48,700	33,000[5]	127,000	119,000	119,000
Tooele Valley	11	0	27	3	24,500[6]	500	4,700	150	30,000	28,000	27,000
Utah and Goshen Valleys	14	18	156	10	56,000	10,200	26,900	12,700[8]	106,000	118,000	93,000
Juab Valley	19	0	16	1	18,200	50	670	200	19,000	29,000	24,000
Sevier Desert	22	7	43	1	35,700	2,000	600	900	39,000	50,000	28,000
Sanpete Valley	18	1	44	4	20,500	1,000	1,500	3,500[8]	26,000	36,000	19,000
Upper and central Sevier Valleys and upper Fremont River valley[9]	20	1	77	3	16,500	100	2,800	6,300	26,000	26,000	21,000
Pavant Valley	21	1	22	2	86,800	100	600	300	88,000	117,000	87,000
Cedar City Valley	29	1	20	4	27,600[10]	1,000	2,100	300	31,000	40,000	33,000
Parowan Valley	28	0	8	3	28,400[10,11]	250	350	150	29,000	33,000	27,000
Escalante Valley											
Milford area	24	0	9	4	57,000[12]	0	1,000	300	58,000	65,000	59,000
Beryl-Enterprise area	30	0	12	2	69,600[10]	0	300	750	71,000	81,000	79,000
Other areas[13]		61	632	102	90,000	3,300	18,500	1,200	113,000	121,000	83,000
Totals (rounded)		177	1,231	167	562,000	76,000	129,000	62,000	829,000	947,000	767,000

[1] Compiled from data supplied by Utah Department of Natural Resources, Division of Water Rights. Includes deepened and replacement wells.

[2] Wells (6 inches or more in diameter) constructed for irrigation, industry, or public supply. Included under "6 inches or more."

[3] From Gates and others (1978, p. 5).

[4] Calculated from previous reports of this series. Some figures include unpublished revisions.

[5] Includes some use for fish and fur culture.

[6] Includes some domestic and stock use.

[7] Includes some use for air conditioning.

[8] Includes some use for irrigation.

[9] Upper Fremont River valley included in "Other areas" prior to 1976.

[10] Data from reports of local water commissioners to the Utah Department of Natural Resources, Division of Water Rights.

[11] Includes some use for stock.

[12] Data from the Milford Water Commissioner.

[13] Withdrawals are estimated minimum amounts.

Table 3.—Total annual withdrawal of water from wells in major areas of ground-water development in Utah, 1968-77
(Thousands of acre-feet)

Area	Number in figure 1	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Cache Valley	5	22	26	25	24	23	24	24	25	27	32
East Shore area[1]	9	46	38	39	41	41	42	50	41	41	52
Jordan Valley	10	107	109	109	116	124	129	130	122	124	119
Tooele Valley	11	22	23	25	24	29	29	33	29	30	28
Utah and Goshen Valleys	14	74	78	83	86	91	89	106	98	107	118
Juab Valley	19	17	18	18	21	30	17	31	25	29	29
Sevier Desert	22	29	21	16	17	40	22	25	26	33	50
Sanpete Valley	18	13	15	14	16	20	16	17	15	25	36
Upper and central Sevier Valleys											
and upper Fremont River valley[2]	20	19	20	19	19	19	19	20	24	25	26
Pavant Valley	21	63	75	71	79	99	69	101	98	95	117
Cedar City Valley[3]	29	30	27	31	36	35	27	42	28	37	40
Parowan Valley[3]	28	22	20	26	24	28	26	31	28	34	33
Escalante Valley											
Milford area[4]	24	49	52	56	58	59	52	70	60	67	65
Beryl-Enterprise area[3]	30	74	84	70	75	77	74	93	85	79	81
Other areas[5]		48	56	72	75	80	79	106	85	108	121
Totals (rounded)		640	660	670	710	800	710	880	790	860	947

[1] Discharge from flowing wells estimated by well count prior to 1969 and by changes in artesian pressure from 1969 through 1977.

[2] Upper Fremont River valley included in other areas prior to 1976.

[3] Beginning in 1968, withdrawals for irrigation have been obtained from reports of local water commissioners to the Utah Department of Natural Resources, Division of Water Rights.

[4] Beginning in 1968, withdrawals for irrigation have been obtained from the Milford Water Commissioner.

[5] Estimated minimum amounts.

Of the 33 stations for which graphs of cumulative departure from average annual precipitation are included in this report, 30 had above-average precipitation in 1978. Taken together, precipitation at all 33 stations was about 30 percent above average in 1978. This was considerably more than the precipitation during the drought reported by Gates and others (1978, p. 2), which lasted from October 1976 through April 1977 and resulted in record high ground-water withdrawals during 1977.

The above-average precipitation in most parts of the State during 1978 resulted in increased runoff and ground-water recharge. These coupled with reduced ground-water withdrawals resulted in general rises of ground-water levels in many parts of the State from spring of 1978 to spring of 1979. Notable exceptions were (1) large parts of Cedar, Pavant, and Parowan Valleys and the Milford and Beryl-Enterprise areas (fig. 1, areas 13, 21, 28, 24, and 30), where ground-water withdrawals exceeded the natural rate of ground-water recharge, and (2) much of Jordan Valley (fig. 1, area 10), where small, but widespread, water-level declines resulted from late season pumping for public supply.

Above-average precipitation and increased surface-water supplies apparently also influenced well-drilling activity in the State. The number of wells drilled during 1978 (table 2), as indicated by well-drillers' reports filed with the Utah Division of Water Rights, was about 13 percent less than reported for 1977. The number of large withdrawal wells drilled during 1978 was about 42 percent less than reported for 1977.

The larger ground-water basins and those containing most of the ground-water development in Utah are shown in figure 1. Table 2 gives information about the number of wells constructed, withdrawals of water from wells for principal uses, and total withdrawals in 1978 for selected major ground-water basins. For comparison, total withdrawals in 1977 and average annual withdrawals during the 10-year period 1968-77 are also shown. Table 3 shows the annual withdrawals from the major basins for the period 1968-77.

MAJOR AREAS OF GROUND–WATER DEVELOPMENT

CACHE VALLEY

by W. N. Jibson

Total discharge from wells in Cache Valley in 1978 was about 26,000 acre-feet (32 hm^3). This was a decrease of 6,000 acre-feet (7 hm^3) from the amount withdrawn in 1977 but was 1,000 acre-feet (1.2 hm^3) more than the 1968-77 average annual withdrawal (table 2). The decrease in withdrawal from that reported in 1977 was due to a larger surface-water discharge in 1978 available for irrigation and public supply. Discharge of the Logan River during 1978 was 205,400 acre-feet (253 hm^3), nearly three times that of 1977 and 114 percent of the 1941-78 average.

Water levels in most of Cache Valley rose from March 1978 to March 1979 (fig. 2), owing to the above-average precipitation and the decreased withdrawal. Rises ranged from less than 1 foot (0.3 m) along the west side of the valley to nearly 4 feet (1.2 m) in the Smithfield-Logan area. Declines of less than 2 feet (0.6 m) were measured in the Newton-Clarkston area and west of Richmond.

The long-term trend of the water level in well (A-12-1)29cab-1, the annual discharge of the Logan River near Logan, and the cumulative departure from the average annual precipitation at Logan Utah State University are shown for comparison in figure 3 along with annual withdrawals from wells. Annual precipitation in 1978 of 18.21 inches (460 mm) was 0.38 inch (10 mm) above the 1941-78 average. This was reflected in the above-average discharge in the Logan River, reduced ground-water withdrawals, and the rise of 1.3 feet (0.4 m) in well (A-12-1) 29cab-1.

EAST SHORE AREA

by P. Kay Contratto

The withdrawal of water from wells in the East Shore area in 1978 was about 40,000 acre-feet (49 hm^3), 12,000 acre-feet (15 hm^3) less than the amount reported for 1977 and 3,000 acre-feet (3.7 hm^3) less than the

1968-77 average (table 2). The decrease was due chiefly to decreased withdrawals for public supply, which were well-above average in 1977 owing to drought conditions that year.

Water levels rose from March 1978 to March 1979 in most of the East Shore area (fig. 4). The rises were due to decreased withdrawals from wells and to above-average precipitation during 1978.

The long-term relation between water levels in selected wells and precipitation at Ogden Pioneer powerhouse is shown in figure 5. Annual precipitation for 1978 was 3.77 inches (96 mm) above the 1937-78 average of 20.83 inches (529 mm). The above-average precipitation is reflected by a rise of water levels in three of the four observation wells for which hydrographs are shown.

JORDAN VALLEY

by R. W. Mower

Withdrawal of water from wells in Jordan Valley in 1978 was 127,000 acre-feet (157 hm^3), 8,000 acre-feet (10 hm^3) more than the amount reported for 1977 (fig. 6) and 8,000 acre-feet (10 hm^3) more than the annual average reported for the previous 10-year period, 1968-77 (table 2). Withdrawals in 1978 for irrigation decreased by about 30 percent because of above-average precipitation and increased availability of surface-water supplies for irrigation. Withdrawals for domestic and stock remained unchanged. However, withdrawals for public supply and industry increased to accommodate the growth of population and industry in the valley.

According to figure 7, water levels declined from February 1978 to February 1979 in 65 percent of Jordan Valley and rose in 35 percent; the average change in water level in the valley was a decline of 0.6 foot (0.2 m). The largest observed decline was 6 feet (1.8 m) in a well near the northern part of Salt Lake City. Water levels rose a maximum of 14 feet (4 m) in a well about 2 miles (3.2 km) southwest of Riverton. The maximum declines were due to pumping for public supply in some wells later in the year than usual. The rises mainly were due to less pumping from irrigation wells in 1978 than in 1977.

The relation between fluctuations of water levels in selected wells and precipitation is illustrated in figure 8. Precipitation at Silver Lake Brighton during 1978 was 4.55 inches (116 mm) above the average for 1931-78. The above average precipitation resulted in above-average streamflow and recharge and locally in decreased pumping, which are reflected in rises of water levels at three of the five observation wells.

TOOELE VALLEY

by Judy Steiger

During 1978 approximately 30,000 acre-feet (37 hm^3) of water was withdrawn from wells in Tooele Valley. This amount is 2,000 acre-feet (2.5 hm^3) more than reported for 1977 and 3,000 acre-feet (3.7 hm^3) more than the average annual withdrawal for the previous ten years, 1968-77 (table 2). The increase in withdrawal was due to increased requirements for irrigation and public supply.

The discharge from springs in 1978 was approximately 16,000 acre-feet (20 hm^3), which is 1,000 acre-feet (1.2 hm^3) less than reported for 1977. About 2,000 acre-feet (2.5 hm^3) of the spring discharge was used for irrigation and stock in the valley, and about 14,000 acre-feet (17 hm^3) was diverted to Jordan Valley for industrial use.

Water levels declined in most of the valley from March 1978 to March 1979 (fig. 9). Declines, generally less than 4 feet (1.2 m) occurred in the Erda, Marshall, Tooele, and Burmester districts; they are attributed to below-normal precipitation during the 1978 growing season and to increased pumpage for irrigation and public supply. Water levels rose in the Grantsville district where pumping for irrigation was less than in 1977.

The relation between water levels in selected wells and precipitation at Tooele is shown in figure 10. Of the six wells for which data are available, water levels declined in five and rose in one. Precipitation at Tooele in 1978, although deficient during the growing season, was about 121 percent of the 1936-78 annual average.

UTAH AND GOSHEN VALLEYS

by Judy Steiger

Withdrawal of water from wells in Utah and Goshen Valleys in 1978 was about 106,000 acre-feet (131 hm^3). This withdrawal is 12,000 acre-feet (15 hm^3) less than reported for 1977 and 13,000 acre-feet (16 hm^3) more than the 1968-77 average (table 2). Withdrawals for public supply and irrigation in 1978 were significantly less than in 1977--3,400 and 10,800 acre-feet (4.2 and 13 hm^3), respectively. This is attributed to above-average precipitation and increased runoff during 1978, which in turn reduced the need for supplemental ground-water supplies. Industrial use was 2,100 acre-feet (2.6 hm^3) more than in 1977. In Utah Valley, 85,900 acre-feet (106 hm^3) was withdrawn in 1978, or about 10,800 acre-feet (13 hm^3) less than in 1977. In Goshen Valley, 19,900 acre-feet (25 hm^3) was withdrawn in 1978, or about 1,400 acre-feet (1.7 hm^3) less than in 1977.

Water levels in most observation wells rose from March 1978 to March 1979 (figs. 11-15). The general rise resulted from decreased ground-water withdrawal and much-above-average precipitation.

The small water-level decline in the water-table aquifer in Goshen Valley may be due to slow recovery from the previous pumping season.

JUAB VALLEY

by V. L. Jensen

Withdrawal of water from wells in Juab Valley during 1978 was about 19,000 acre-feet (23 hm^3), a decrease of 10,000 acre-feet (12 hm^3) from that reported for 1977 and 5,000 acre-feet (6 hm^3) less than the 1968-77 average (table 2). The decrease in withdrawals was due to increased amount of surface water available for irrigation.

Water levels rose from March 1978 to March 1979 throughout Juab Valley where data are available (fig. 16), owing to increased recharge from above-average precipitation and runoff and to decreased withdrawals of ground water for irrigation.

The relation between water levels in two selected wells and cumulative departure from the 1935-78 average annual precipitation at Nephi is shown in figure 17. Precipitation at Nephi during 1978 was 5.99 inches (152 mm) above the 1935-78 annual average.

SEVIER DESERT

by R. W. Mower

Withdrawal of water from wells in the Sevier Desert in 1978 was about 39,000 acre-feet (48 hm^3), which was 11,000 acre-feet (14 hm^3) less than was reported for 1977 and about 11,000 acre-feet (14 hm^3) more than the average annual withdrawal for the previous 10 years, 1968-77 (table 2). The decrease from 1977 to 1978 was due to a more adequate surface-water supply for irrigation in 1978 and less dependence on ground water to supplement that supply. During 1978, discharge of the Sevier River near Juab was about 126,000 acre-feet (155 hm^3) (fig. 20). This was about 20,000 acre-feet (25 hm^3) more than the 1977 discharge (19 percent more) but about 14,200 acre-feet (17 hm^3) (10 percent) less than the average discharge for 1935-78.

In those parts of the Sevier Desert where there are observation wells, water levels rose from March 1978 to March 1979 in 80 percent of the lower artesian aquifer and in 60 percent of the upper artesian aquifer (figs. 18 and 19). The largest observed water-level rise in the lower artesian aquifer was 4.4 feet (1.3 m) just north of Oak City. The largest observed rise in the upper artesian aquifer was 2.6 feet (0.8 m) about 2 miles (3.2 km) southeast of Delta. Observed water-level declines in the lower artesian aquifer were all less than 1 foot (0.3 m). The largest observed decline in the upper artesian aquifer was 1.5 feet (0.5 m) about 2 miles (3.2 km) southwest of Deseret.

The long-term relation between precipitation at Oak City, discharge of the Sevier River near Juab, water levels in selected wells, and discharge from wells is shown in figure 20. Precipitation at Oak City in 1978 was 6.94 inches (176 mm) above the 1935-78 annual average. The water levels from March 1978 to March 1979 declined in two of the three observation wells because of continued large withdrawals of ground water, but rose in well (C-16-7)4abb-1 north of Delta where withdrawals for irrigation were considerably less than in 1977.

SANPETE VALLEY

by M. D. ReMillard

Approximately 26,000 acre-feet (32 hm^3) of water was withdrawn from wells in Sanpete Valley during 1978; this was 10,000 acre-feet (12 hm^3) less than the amount withdrawn in 1977 and 7,000 acre-feet (9 hm^3) more than the average annual withdrawal for the period 1968-77 (table 2). The decreased withdrawal of water from irrigation wells during 1978 was due to above-average precipitation and more streamflow available for irrigation.

Water levels rose in most of Sanpete Valley from March 1978 to March 1979 (fig. 21). Rises of nearly 20 feet (6.0 m) were measured in the Ephraim area and rises of at least 10 feet (3.0 m) were measured near Manti, Fairview, and Fountain Green. The only recorded decline was in a well in the northeast part of the valley, near Milburn. This decline of 3 feet (0.9 m) may have been due to application of less water on nearby irrigated land than in previous years and, therefore, reduced recharge from that land.

Long-term hydrographs of water levels in three wells in Sanpete Valley, the long-term trend of precipitation at Manti, and annual withdrawals from wells are shown in figure 22. Precipitation during 1978 was above average for the first time since 1973. The above-average precipitation is reflected by water-level rises in all three observation wells and a decreased withdrawal of ground water.

UPPER AND CENTRAL SEVIER VALLEYS AND UPPER FREMONT RIVER VALLEY

by D. C. Emett

Withdrawal of water from wells in the upper and central Sevier Valleys and upper Fremont River valley was about 26,000 acre-feet (32 hm^3) in 1978. This was the same as in 1977 and 5,000 acre-feet (6 hm^3) more than the 1968-77 annual average (table 2).

Of 28 observation wells for which data are available, water levels rose in 14, declined in 12, and remained the same in 2 from March 1978 to March 1979 (fig. 23). The largest observed rise, 6.5 feet (2 m), occurred in well (C-34-5)4ddd-1 north of Panguitch and was probably caused by seepage from nearby land irrigated with Sevier River water. The largest observed decline, 1.9 feet (0.6 m), occurred in well (D-20-1)20aac-2 in Axtell and was probably caused by nearby pumping during or just prior to the water-level measurement.

The relation of water levels in selected wells to discharge of the Sevier River at Hatch, to precipitation at Panguitch, Salina, and Loa, and to withdrawals from wells is shown in figure 24. Precipitation was above average at Panguitch and Salina. This above-average precipitation is reflected in increased discharge in the Sevier River at Hatch, which was 77,240 acre-feet (95 hm^3), about 4,100 acre-feet (5.1 hm^3) more than the 1940-78 average. The below-average precipitation as recorded at Loa may be reflected in the lower water levels in well (D-28-4)36cdb-1 and other wells in the upper Fremont River valley.

PAVANT VALLEY

by C. T. Sumsion

Withdrawal of water from wells in Pavant Valley in 1978 was 88,000 acre-feet (109 hm^3), which was 29,000 acre-feet (36 hm^3) less than reported for 1977, but 1,000 acre-feet (1.2 hm^3) more than the 1968-77 annual average (table 2). The decrease in withdrawals was brought about by above-average precipitation, making available more surface water for irrigation.

Water levels declined slightly in much of the northern part of the valley even though pumpage for irrigation in that area decreased by about 5 percent (fig. 25). Levels rose in most of the southern part of the valley due to a decrease in pumpage for irrigation of about 32 percent. The largest measured decline was 8.7 feet (2.7 m) in a well 4 miles (6.4 km) west of Holden. The largest measured rise was 24.7 feet (7.5 m) in a well 2.5 miles (4.0 km) north of Meadow.

The relation of water levels in selected wells to ground-water withdrawals and cumulative departure from the 1931-78 average precipitation at Fillmore is shown in figure 26. Water levels declined in three of the observation wells and rose in four wells. Precipitation was about 17 percent above average in 1978.

Some of the water pumped for irrigation in Pavant Valley percolates back to the valley's aquifers as recharge and is withdrawn again for irrigation. Such recirculation of ground water affects its chemical quality (Handy and others, 1969, p. D228-D234); consequently, the general trend since 1957 has been an increased concentration of dissolved solids in water from all wells at which data have been collected (fig. 27). The concentration of dissolved solids in 1978, compared to the most recent preceding measurement, was less in wells (C-21-5)7cdd-3 and (C-23-5)5acd-1 and greater in wells (C-23-6)8abd-1 and (C-23-6)21bdd-1.

CEDAR CITY VALLEY

by P. A. Carroll

Approximately 31,000 acre-feet (38 hm^3) of water was pumped from wells in Cedar City Valley during 1978. This was 9,000 acre-feet (11 hm^3) less than was pumped in 1977 and 2,000 acre-feet (2.5 hm^3) less than the average annual withdrawal for the previous 10 years, 1968-77 (table 2). The overall decrease in pumpage was the result of more runoff in Coal Creek being available for irrigation. Pumpage increased for public supply, however, due to growth in the populations of Cedar City and surrounding subdivisions.

Significant rises in water levels occurred throughout Cedar City Valley. Most declines, generally less than 1 foot (0.3 m), occurred near the valley's edges north and west of Cedar City (fig. 28). The greatest rises, more than 6 feet (1.8 m), occurred in the recharge areas centered near Cedar City and Kanarraville.

Figure 29 shows annual pumpage in Cedar City Valley, annual discharge of Coal Creek, departure from average annual precipitation at Cedar City, and water levels in well (C-35-11)33aac-1. Above-average precipitation caused increased streamflow, which increased the amount of surface water available for irrigation and ground-water recharge. Reduced pumping for irrigation and increased recharge caused water levels in the valley to rise. The water level in well (C-35-11)33aac-1 rose 6.9 feet (2.1 m) from March 1978 to March 1979.

PAROWAN VALLEY

by L. J. Neff

Approximately 29,000 acre-feet (36 hm^3) of water was withdrawn from wells in Parowan Valley in 1978. This was 4,000 acre-feet (5 hm^3) less than reported for 1977 and 2,000 acre-feet (2.5 hm^3) more than the 1968-77 annual average withdrawal (table 2). The decrease is attributed to a decrease in withdrawal for irrigation resulting from more surface water available for irrigation and wider use of sprinkler-irrigation systems.

Water levels declined in almost the entire valley between March 1978 and March 1979 (fig. 30). Declines ranged from less than 1 foot (0.3 m) in the northern part of the valley to locally more than 5 feet (1.5 m) in the southern part. Local water-level rises were recorded north of both Summit and Paragonah. The general decline of water levels is attributed to continued large withdrawals from wells which exceed natural recharge.

The relation of water levels in well (C-34-8)5bca-1 to average annual withdrawals from wells in Parowan Valley and to cumulative departure from the average annual precipitation at Parowan Airport is shown in figure 31. Water levels declined in 1978 for the fourth consecutive year as a result of continued heavy pumping for irrigation.

ESCALANTE VALLEY

Milford area

by G. W. Sandberg

Withdrawal of water from wells in the Milford area in 1978 was about 58,000 acre-feet (72 hm^3)--7,000 acre-feet (9 hm^3) less than was reported for 1977 and 1, 000 acre-feet (1.2 hm^3) less than the average annual withdrawal for the previous 10 years, 1968-77 (table 2). The decrease was due to a decrease in withdrawal for irrigation. This was probably the result of increased use of sprinkler-irrigation systems, above-average precipitation, and more surface water available for irrigation in the southern part of the area.

Water levels declined in the area from March 1978 to March 1979 except in the northern part, in the extreme southern part, and in the vicinity of Minersville (fig. 32). The average water-level change in 45 wells was a decline of 0.97 foot (0.3 m). The largest decline was 5.2 feet (1.6 m) in a well about 4 miles (6.4 km) south of Milford, and the largest rise was 1.2 feet (0.4 m) in a well at Minersville.

The relation of water levels in well (C-29-10)6ddc-2 to precipitation at Milford Airport, to discharge of the Beaver River, and to pumpage for irrigation is shown in figure 33. The decline in well (C-29-10)6ddc-2 was the largest of the past several years even though precipitation was above average, flow of the Beaver River at Rocky Ford Dam near Minersville was near average, and pumpage was less than during 1977. This decline reflects reduced recharge to the pumped area, probably because of some changes in local irrigation practices. Also, relatively little water from the Beaver River is used for irrigation in the vicinity of well (C-29-10)6ddc-2.

ESCALANTE VALLEY

Beryl-Enterprise area

by G. W. Sandberg

Withdrawal of water from wells in the Beryl-Enterprise area in 1978 was about 71,000 acre-feet (88 hm^3), a decrease of 10,000 acre-feet (12 hm^3) from the amount reported for 1977 and 8,000 acre-feet (10 hm^3) less than the average annual withdrawal for the previous 10 years, 1968-77 (table 2). The decrease was due to reduced pumping for irrigation, which resulted from above-normal precipitation that made more than the usual amount of surface water available for irrigation in the southern part of the area.

Water levels declined, generally less than 2 feet (0.6 m), in the central part of the area and rose less than 1 foot (0.3 m) in most of the northern part. Water levels rose more than 12 feet (3.6 m) near Enterprise and more than 5 feet (1.5 m) near Newcastle (fig. 34) due to high runoff in Shoal, Mountain Meadow, and Pinto Creeks during February-April 1978.

The long-term relation between water levels in selected wells, precipitation, and pumpage for irrigation is shown in figure 35. The water level in well (C-35-17)25dcd-1 continued to decline despite reduced ground-water withdrawals.

Figure 36 shows changes in concentration of dissolved solids in the water from wells in the area. The concentrations in 1978 were slightly higher than the concentrations in 1977 in water from wells (C-36-16)5a-9 and (C-34-16)28dcc-2.

OTHER AREAS

by L. R. Herbert

Approximately 113,000 acre-feet (139 hm^3) of water was withdrawn from wells in those areas of Utah listed below:

Number in figure 1		Estimated withdrawal (acre-feet)
1	Grouse Creek valley	3,500
2	Park Valley	2,500
3	Curlew Valley	26,300
8	Ogden Valley	6,600
12	Dugway area (including Skull Valley north of area outlined in fig. 1)	4,800
13	Cedar Valley	3,600
23	Snake Valley	15,300
25	Beaver Valley	12,000
31	Central Virgin River area	18,800
	Remainder of State	19,600
	Total (rounded)	113,000

The total withdrawal was 8,000 acre-feet (10 hm^3) less than the amount reported for 1977 and 30,000 acre-feet (37 hm^3) more than the 1968-77 annual average (table 2). The decrease in withdrawals from wells in 1978 was due to the above-average precipitation, which resulted in increased surface-water supplies for irrigation and other uses. This resulted in less demand on ground-water supplies.

Figure 37 shows the relation between long-term hydrographs of observation wells in selected areas and the cumulative departure from average annual precipitation at sites in or near those areas. Water levels declined in some of the wells from March 1978 to March 1979. The declines were the result of locally large withdrawals of ground water and residual effects of the previous year's below-average precipitation. Water levels rose in most of the wells. The rise in water levels was due to above-average precipitation, which resulted in larger surface-water supplies and less demand on ground-water supplies.

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Gates, J. S., and others, 1978, Ground-water conditions in Utah, spring of 1978: Utah Division of Water Resources Cooperative Investigations Report 17, 63 p.

Handy, A. H., Mower, R. W., and Sandberg, G. W., 1969, Changes in chemical quality of ground water in three areas in the Great Basin, Utah, in Geological Survey Research 1969: U.S. Geological Survey Professional Paper 650-D, p. D228-D234.

National Oceanic and Atmospheric Administration, Environmental Data Service, 1979, Climatological data (annual summary, 1978): v. 79, no. 13.

ILLUSTRATIONS

On all maps showing changes in water levels, areas of water-level rise are indicated by dotted patterns, and areas of water-level decline are indicated by lined patterns

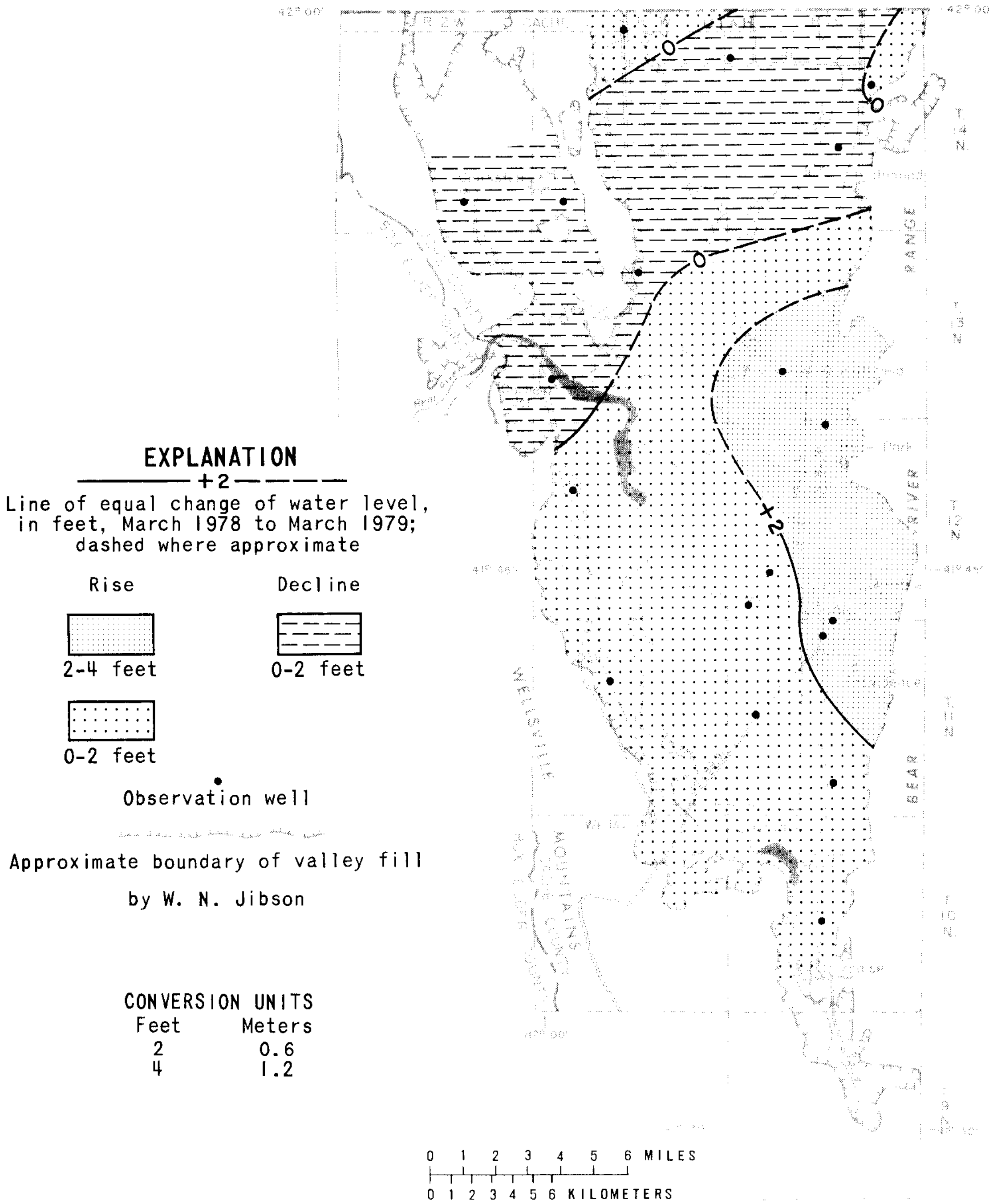


Figure 2.—Map of Cache Valley showing change of water levels from March 1978 to March 1979.

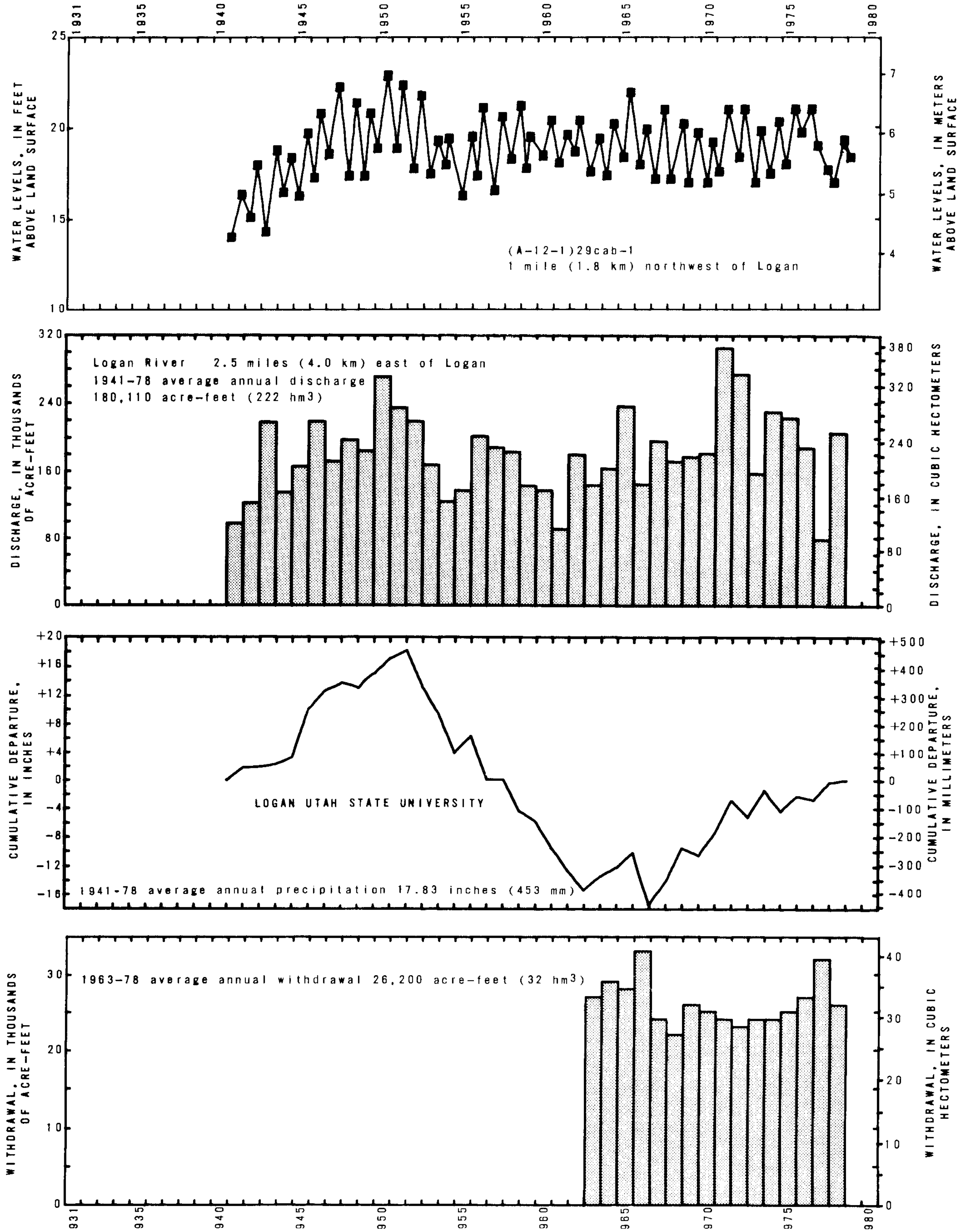


Figure 3.—Relation of water levels in well (A-12-1)29cab-1 in Cache Valley to discharge of the Logan River near Logan, to cumulative departure from the average annual precipitation at Logan Utah State University, and to annual withdrawals from wells.

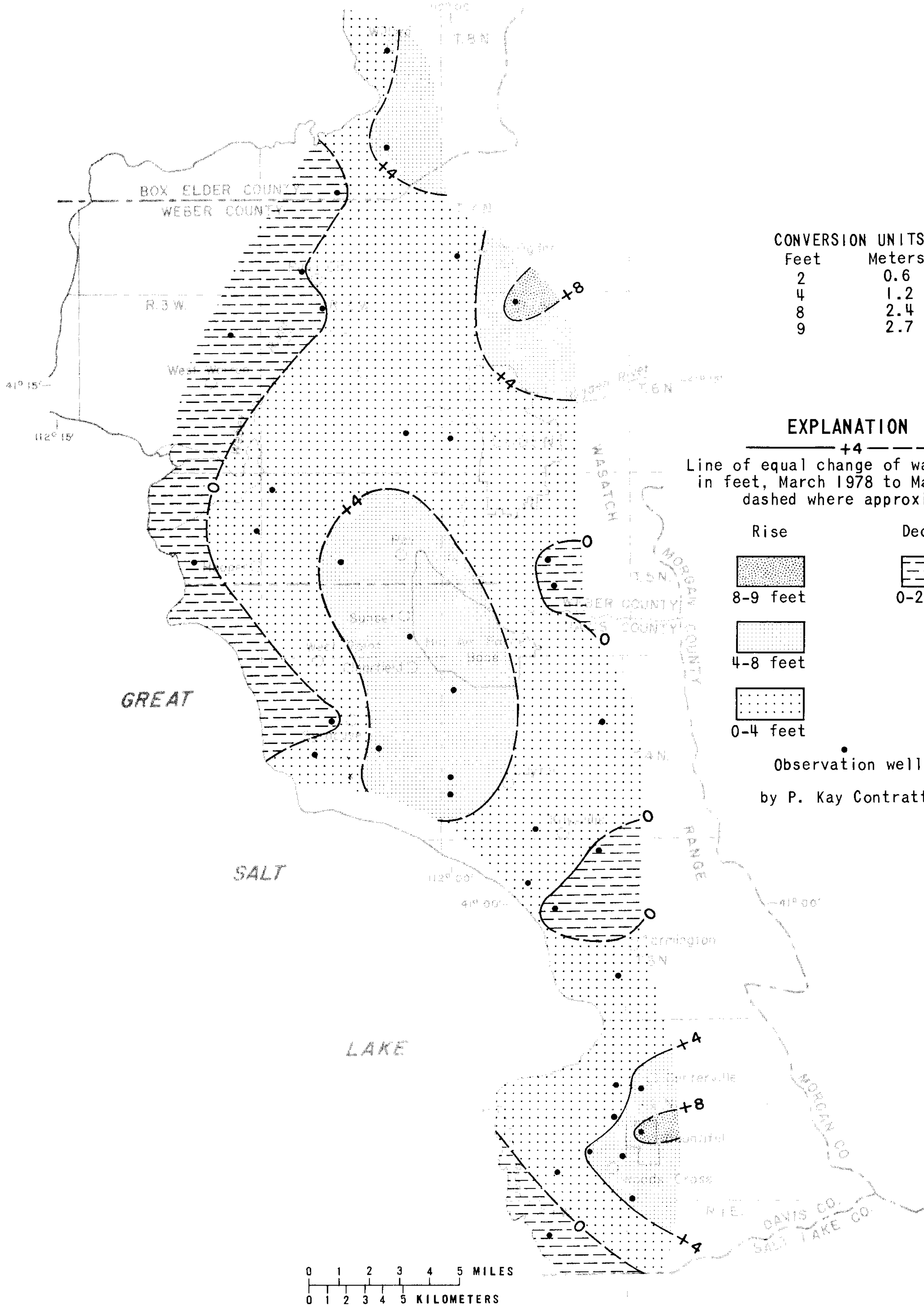


Figure 4.—Map of the East Shore area showing change of water levels from March 1978 to March 1979.

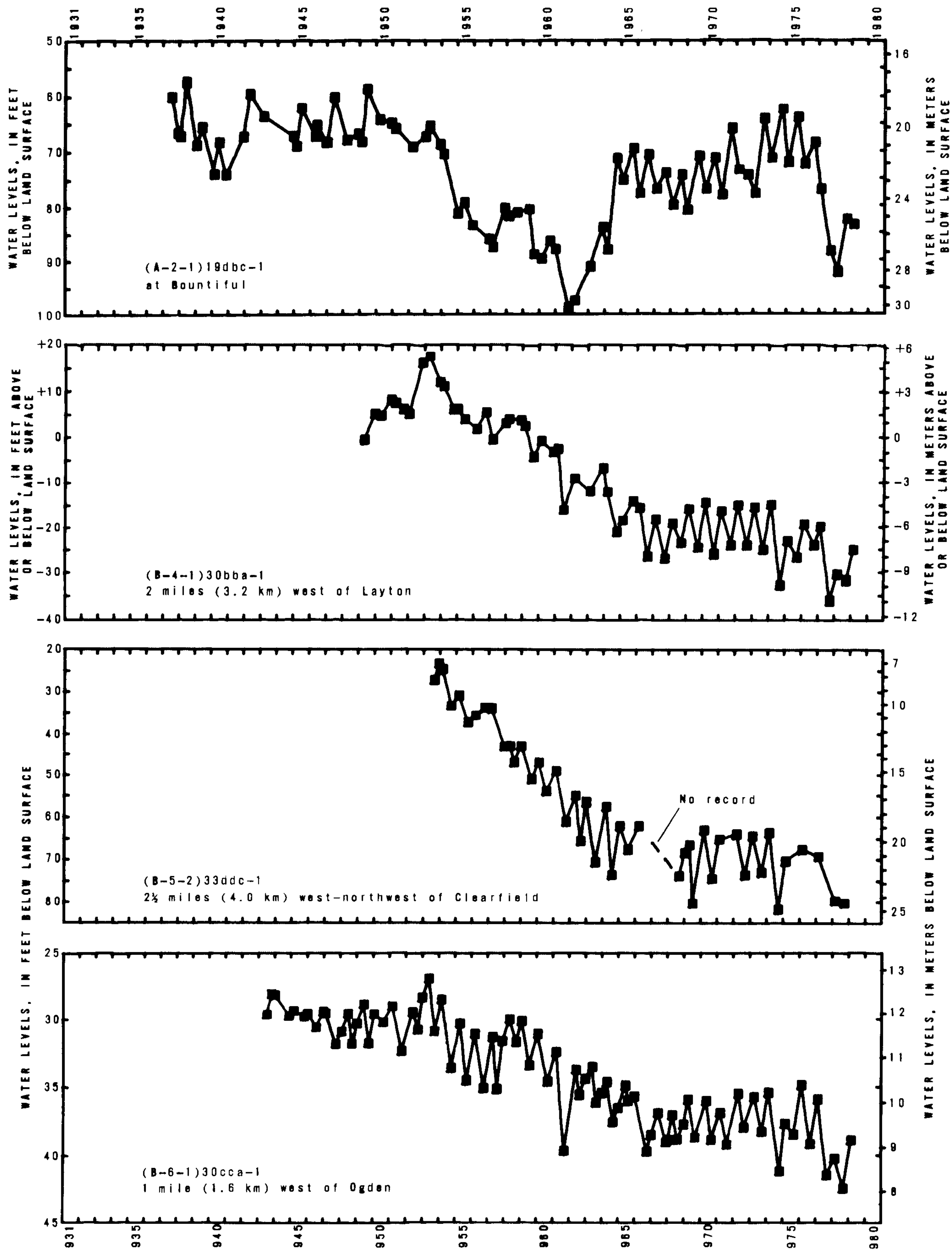


Figure 5.—Relation of water levels in selected wells in the East Shore area to cumulative departure from the average annual precipitation at Ogden Pioneer powerhouse and to annual withdrawals from wells.

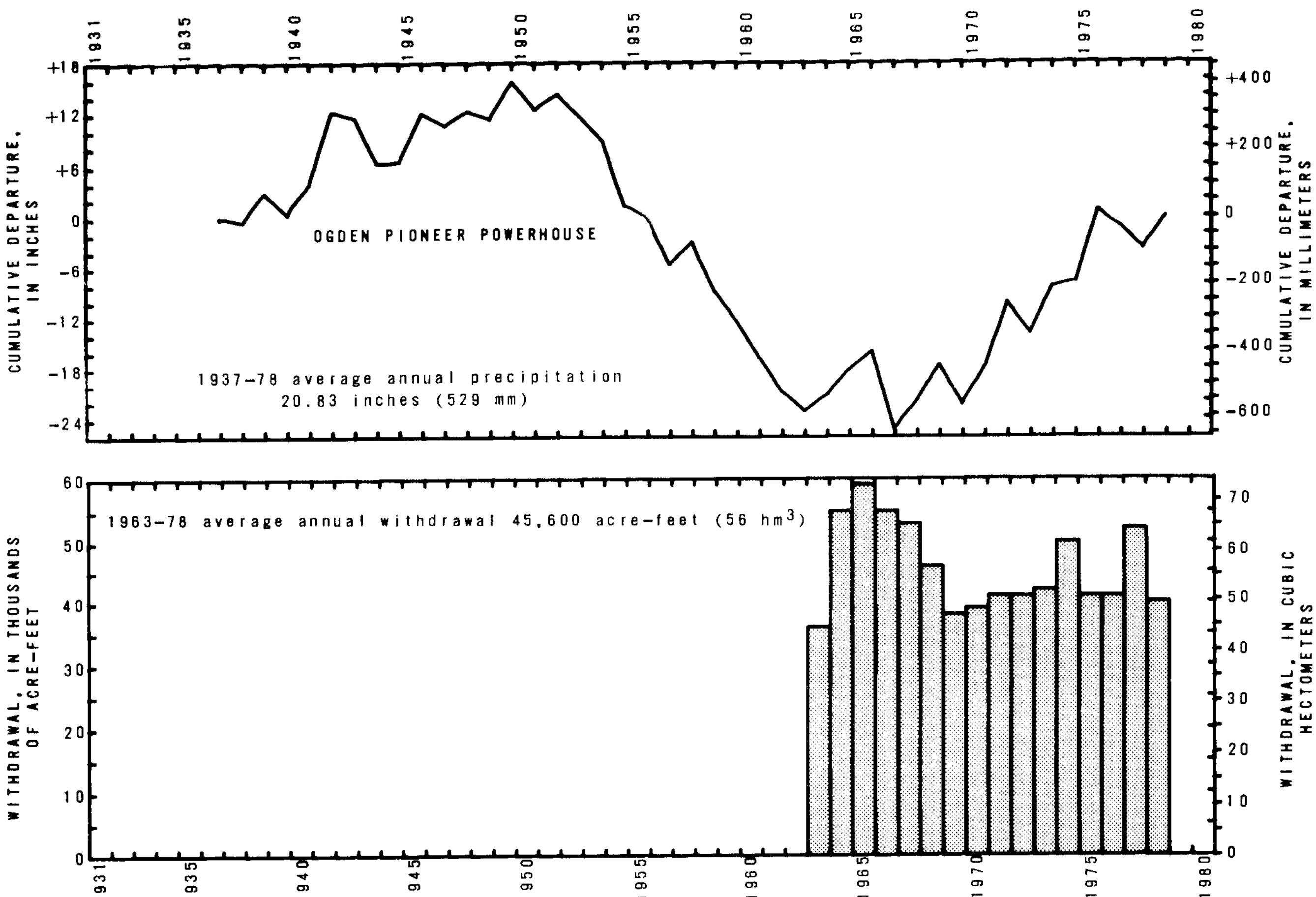


Figure 5.— Continued.

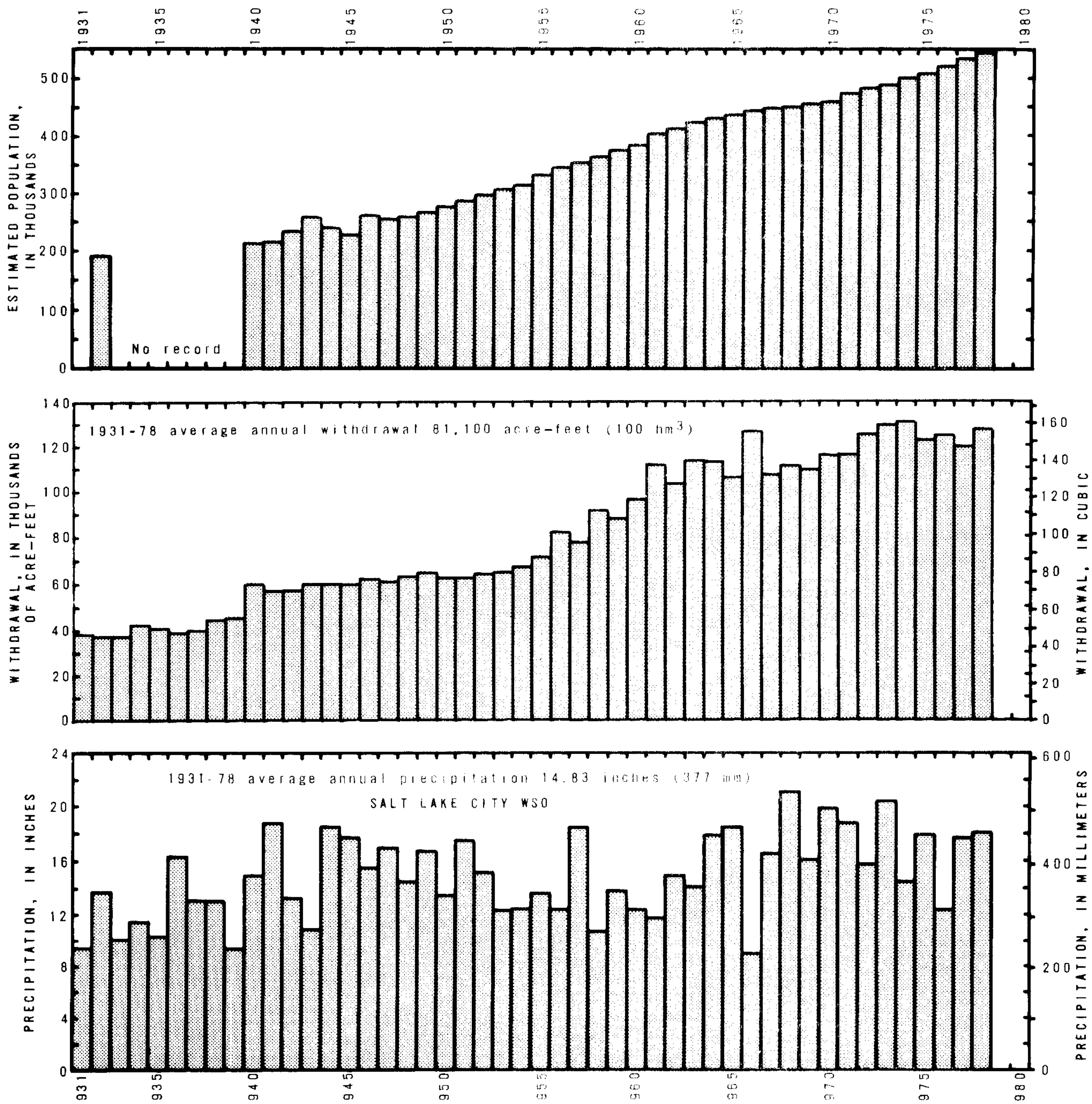


Figure 6.—Estimated population of Salt Lake County, annual withdrawals from wells, and annual precipitation at Salt Lake City WSO (International Airport) for the period 1931-78.

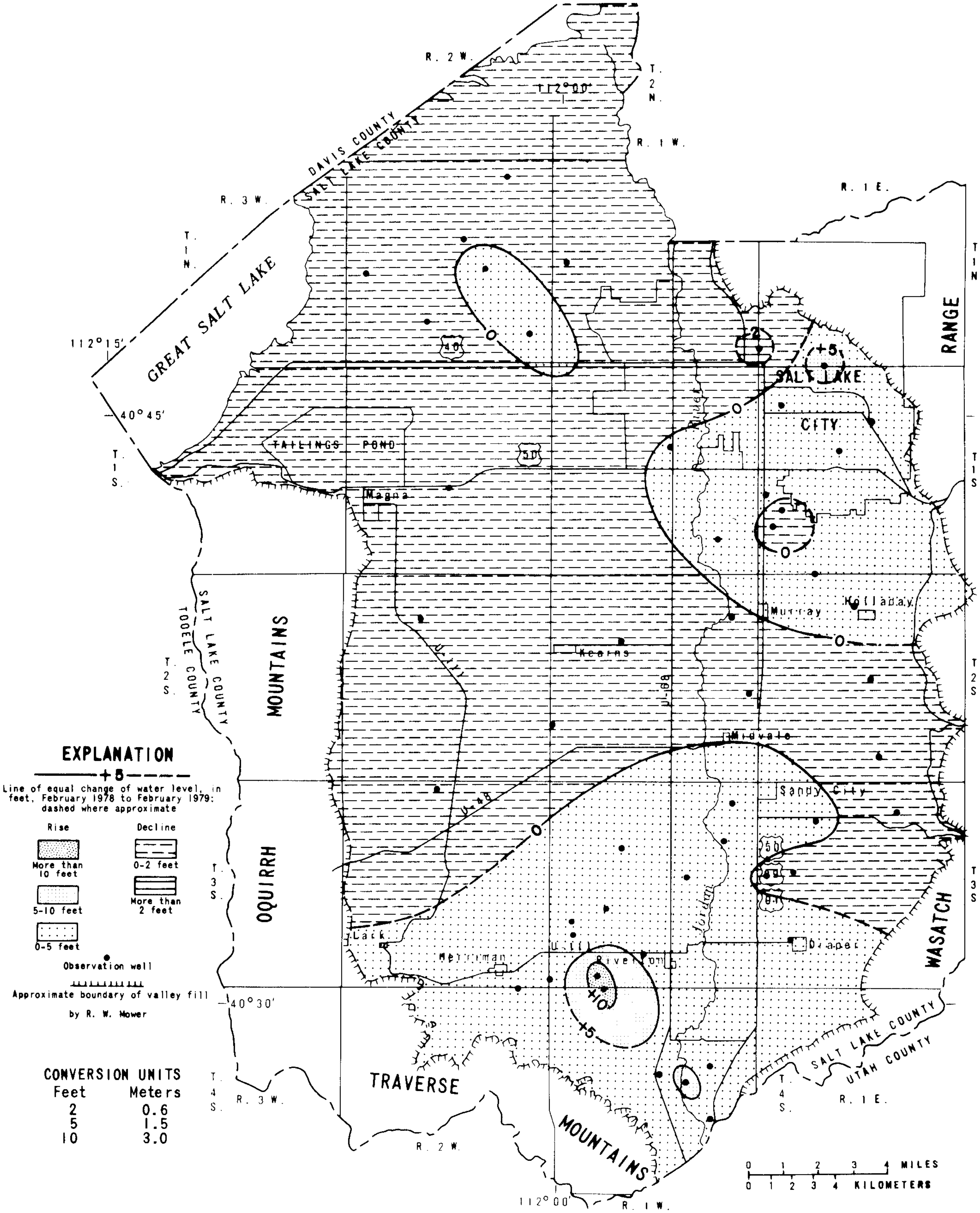


Figure 7.—Map of the Jordan Valley showing change of water levels from February 1978 to February 1979.

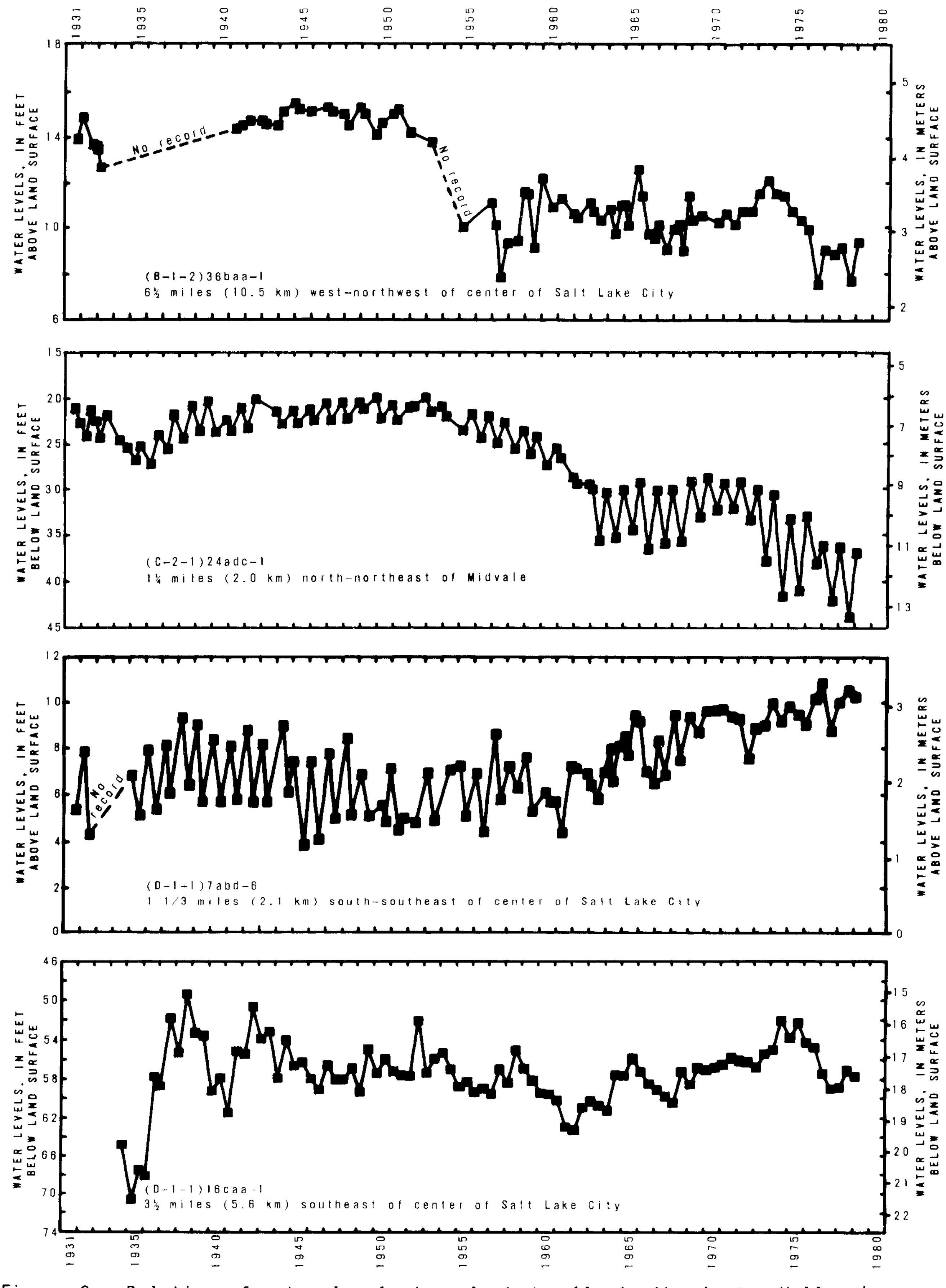


Figure 8.—Relation of water levels in selected wells in the Jordan Valley to cumulative departure from the average annual precipitation at Silver Lake Brighton.

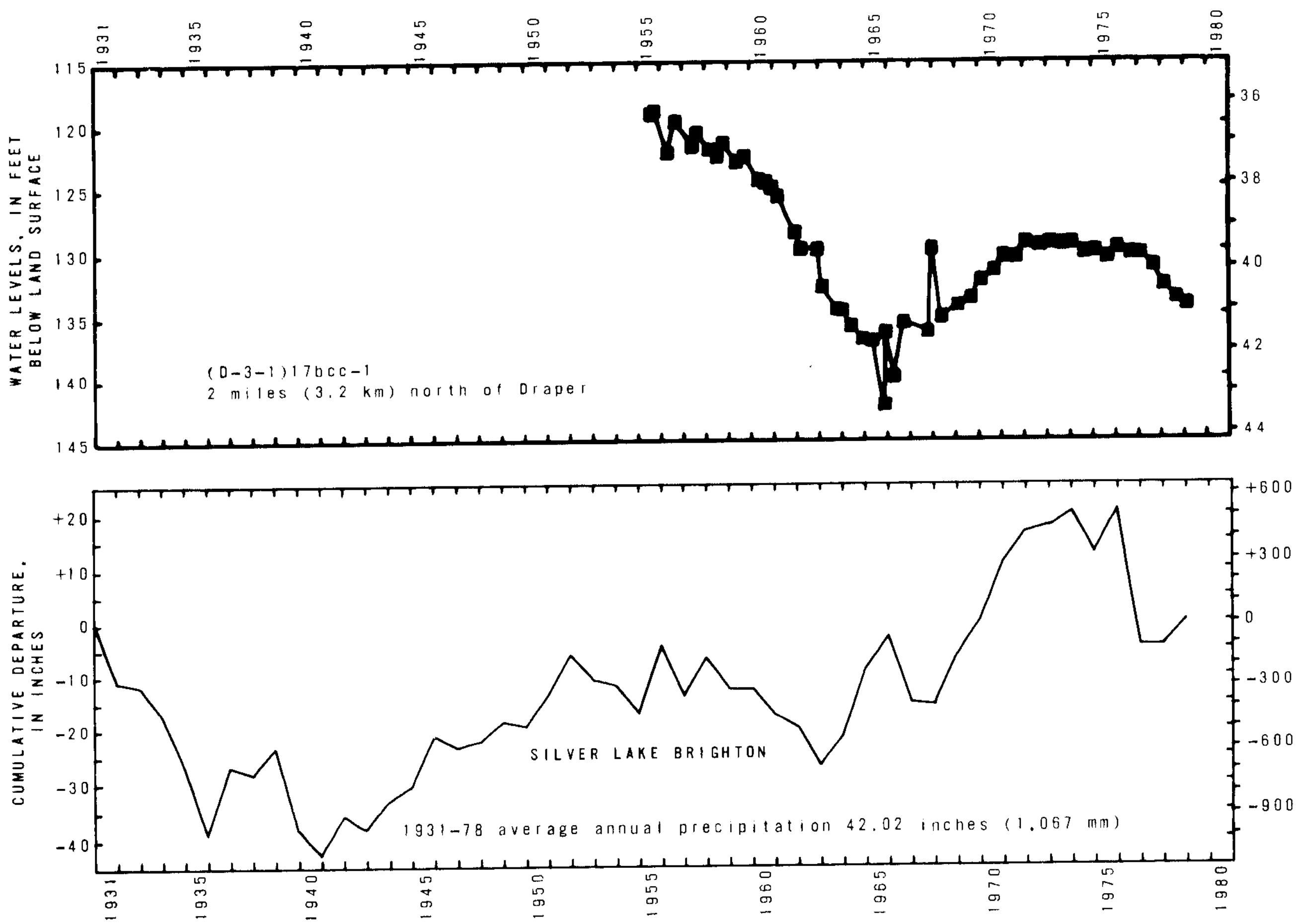


Figure 8.— Continued.

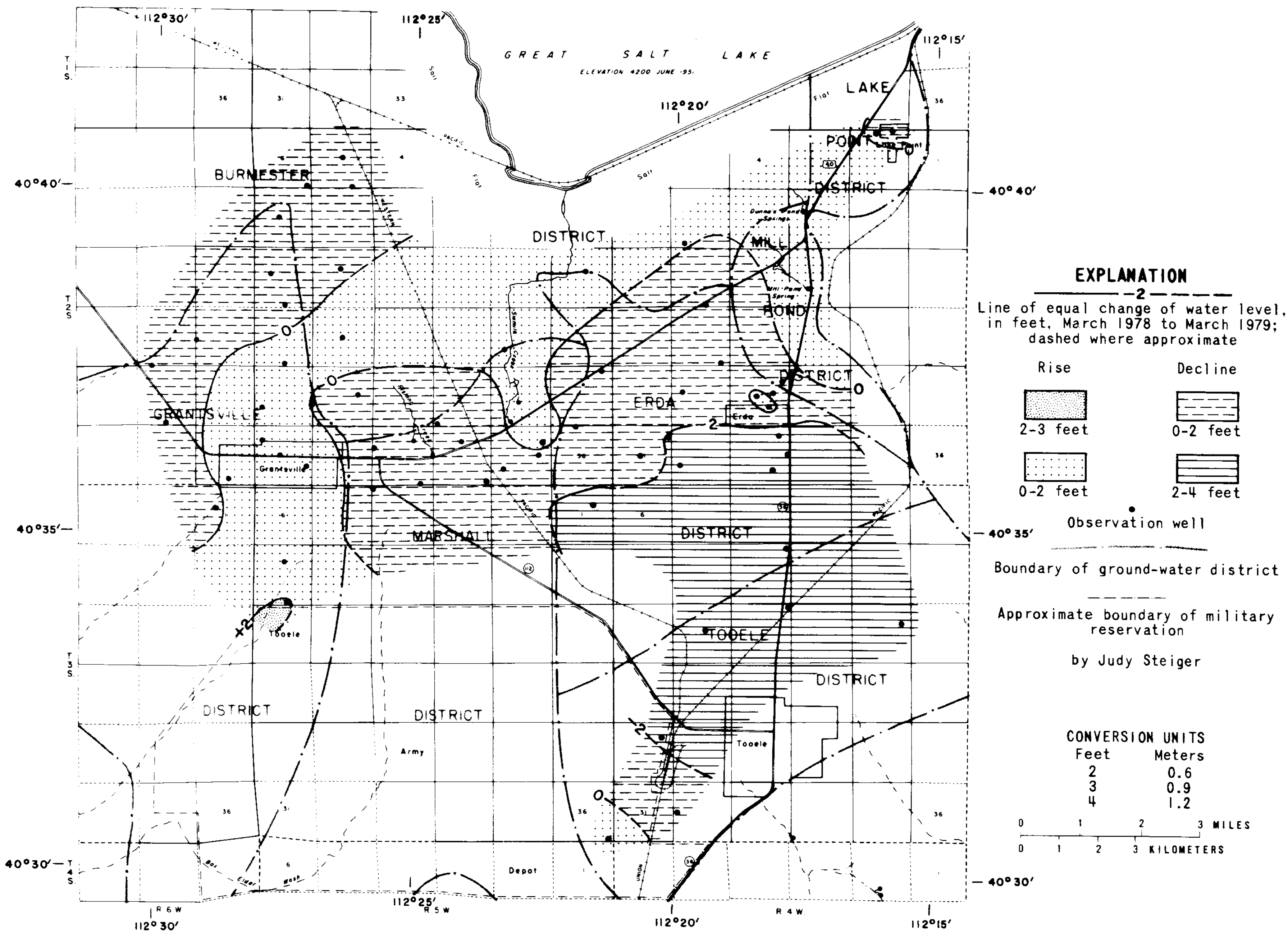


Figure 9.—Map of Tooele Valley showing change of water levels in artesian aquifers from March 1978 to March 1979.

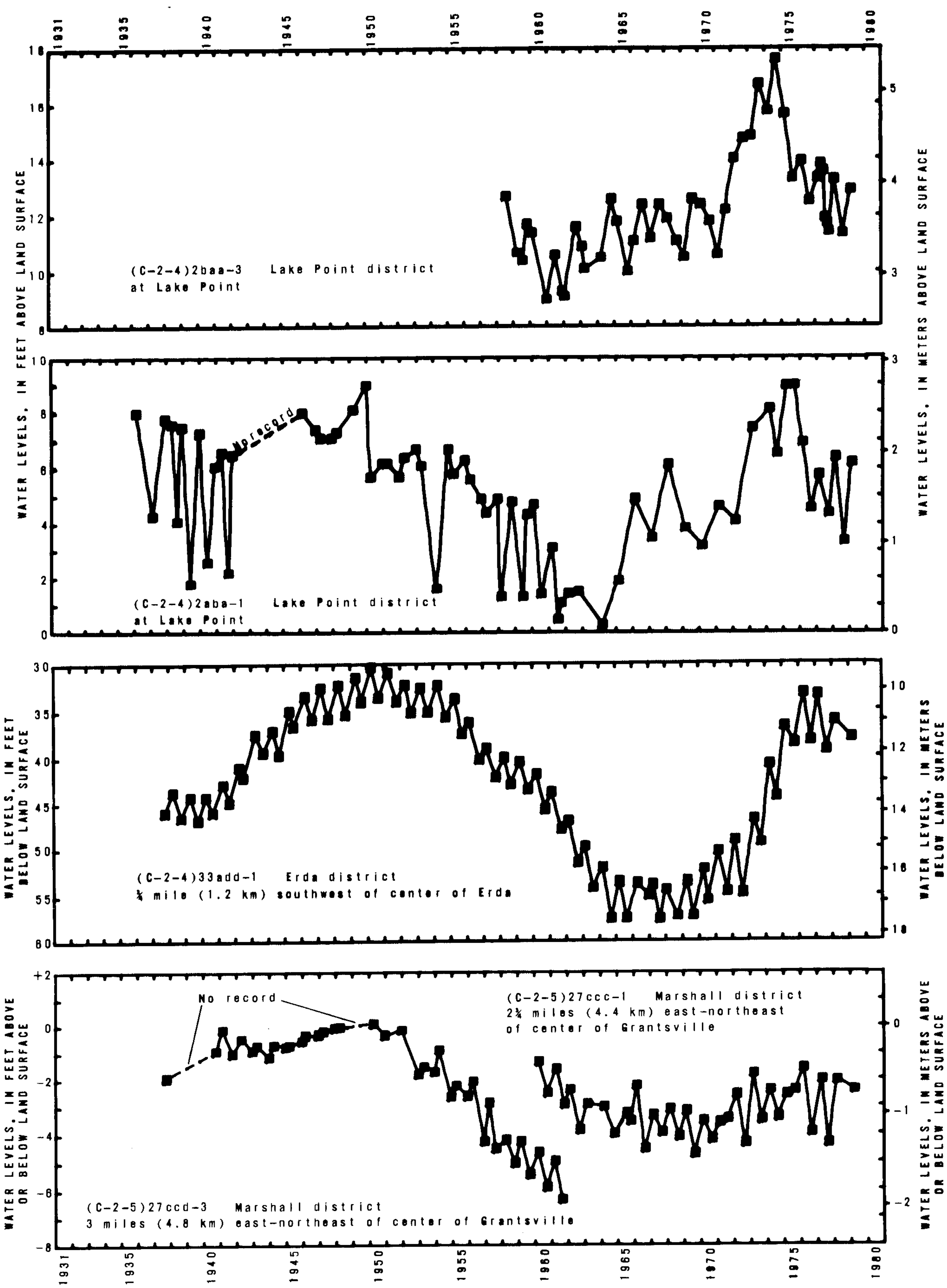


Figure 10.—Relation of water levels in selected wells in Tooele Valley to cumulative departure from the average annual precipitation at Tooele and to annual withdrawals from wells.

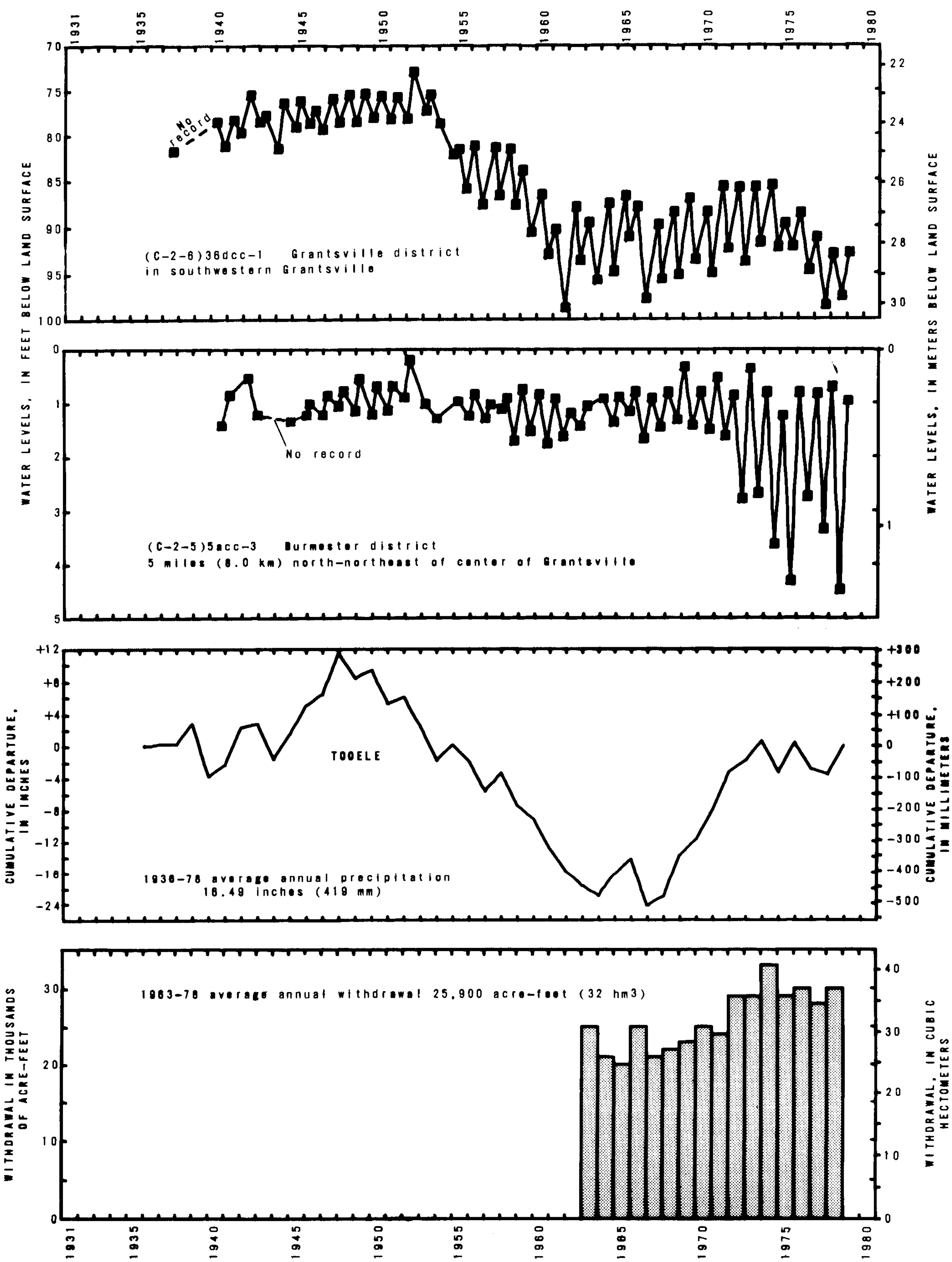


Figure 10.—Continued.

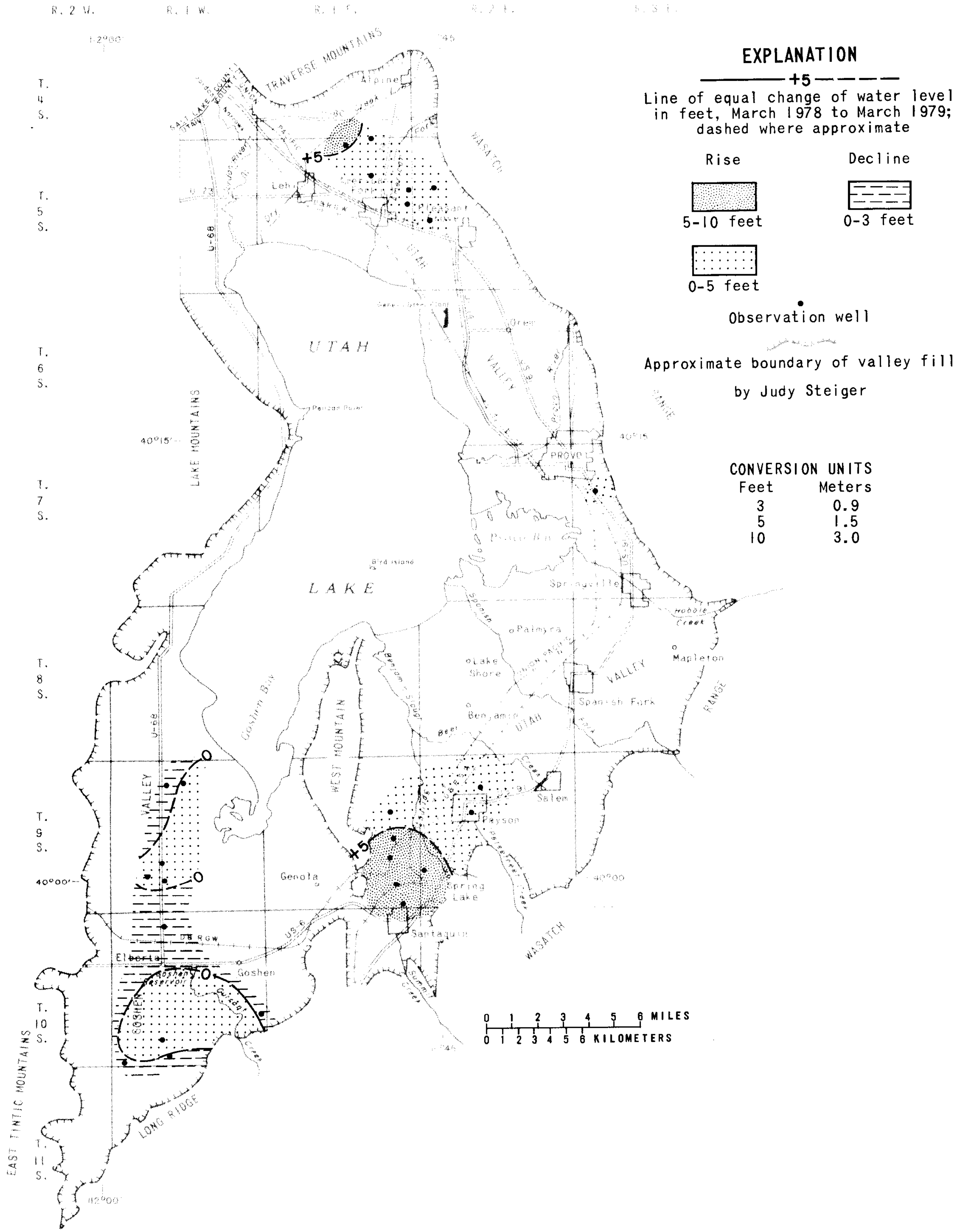


Figure 11.—Map of Utah and Goshen Valleys showing change of water levels in the water-table aquifers from March 1978 to March 1979.

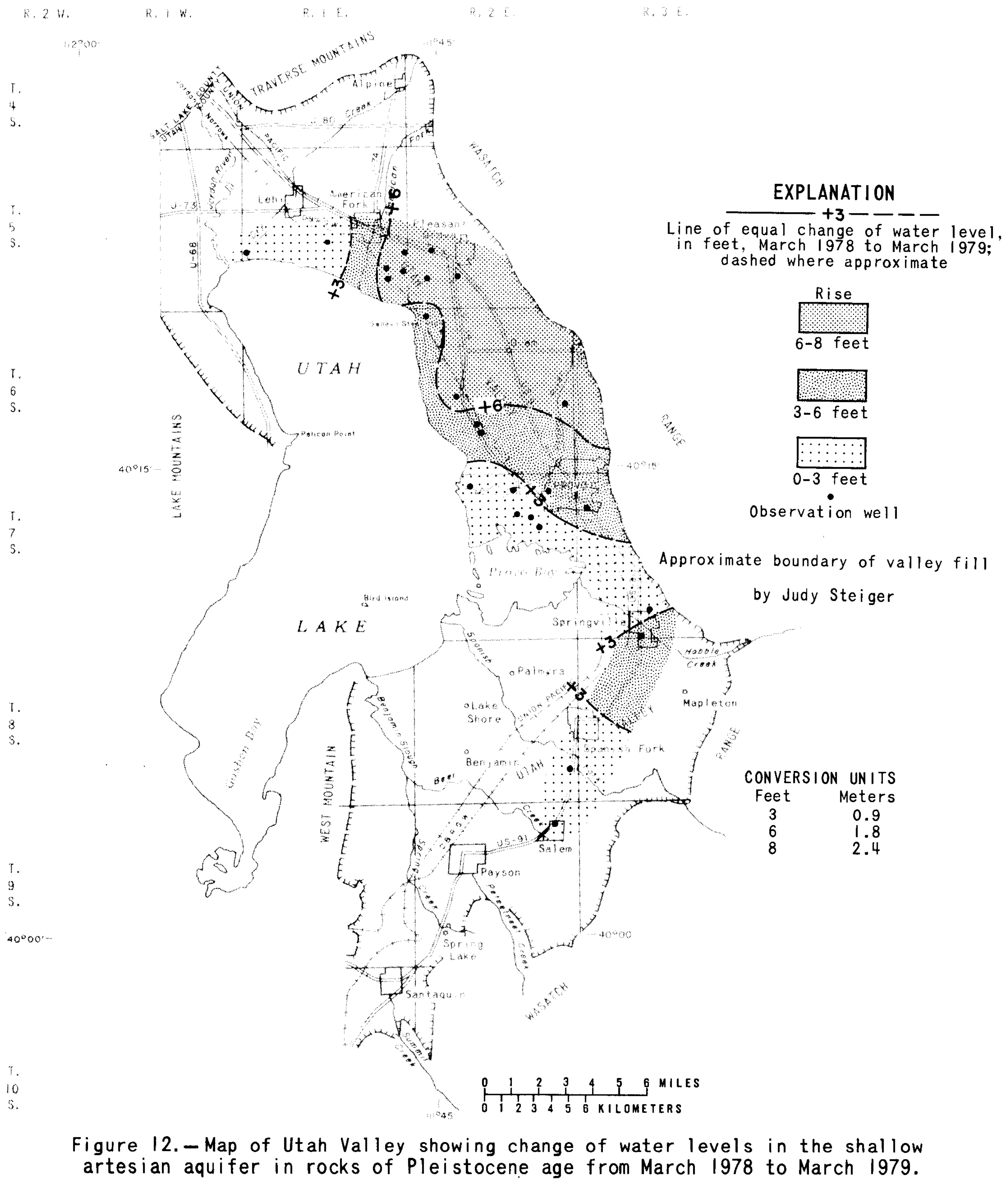


Figure 12.—Map of Utah Valley showing change of water levels in the shallow artesian aquifer in rocks of Pleistocene age from March 1978 to March 1979.

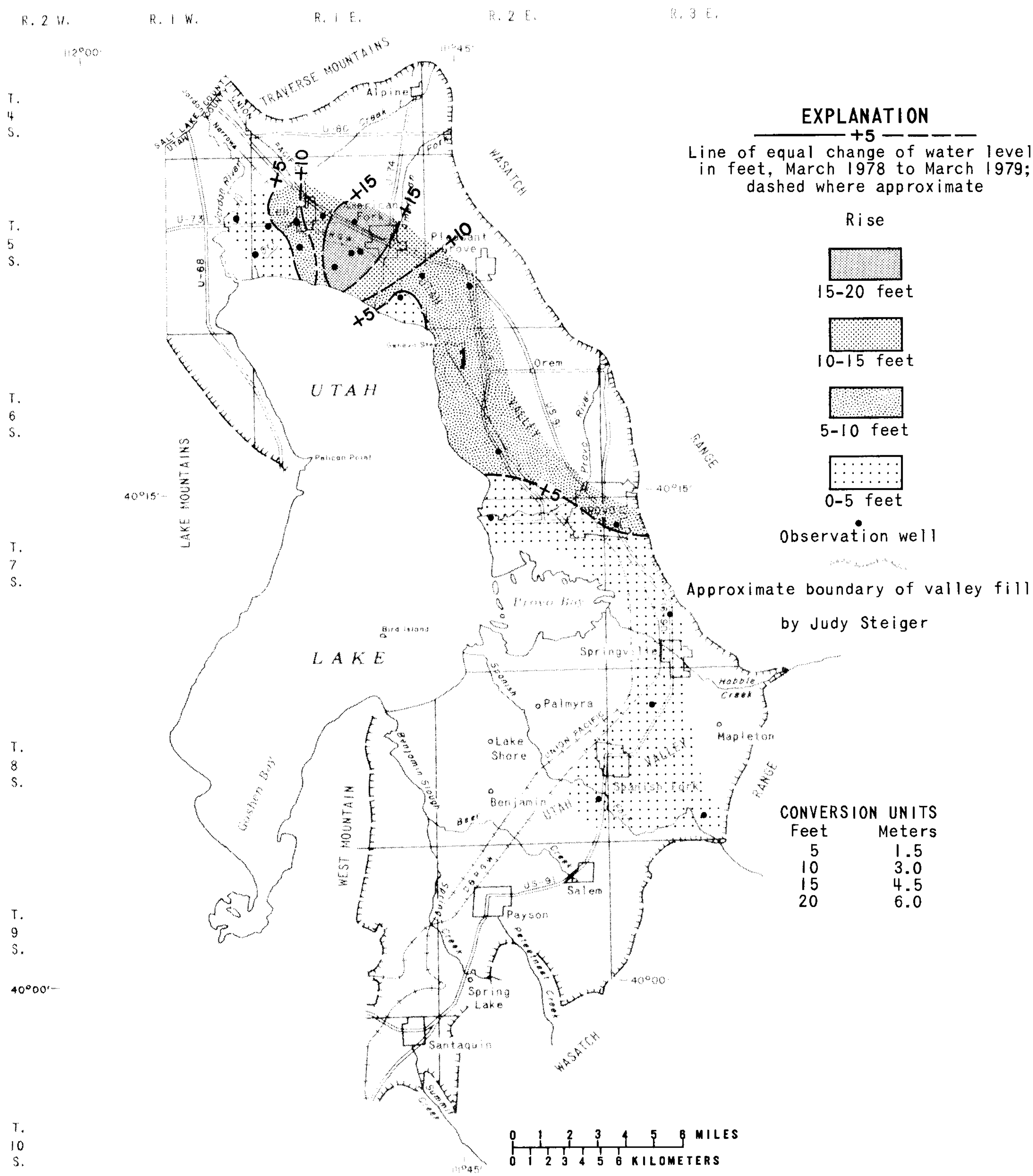


Figure 13.—Map of Utah Valley showing change of water levels in the deep artesian aquifer in rocks of Pleistocene age from March 1978 to March 1979.

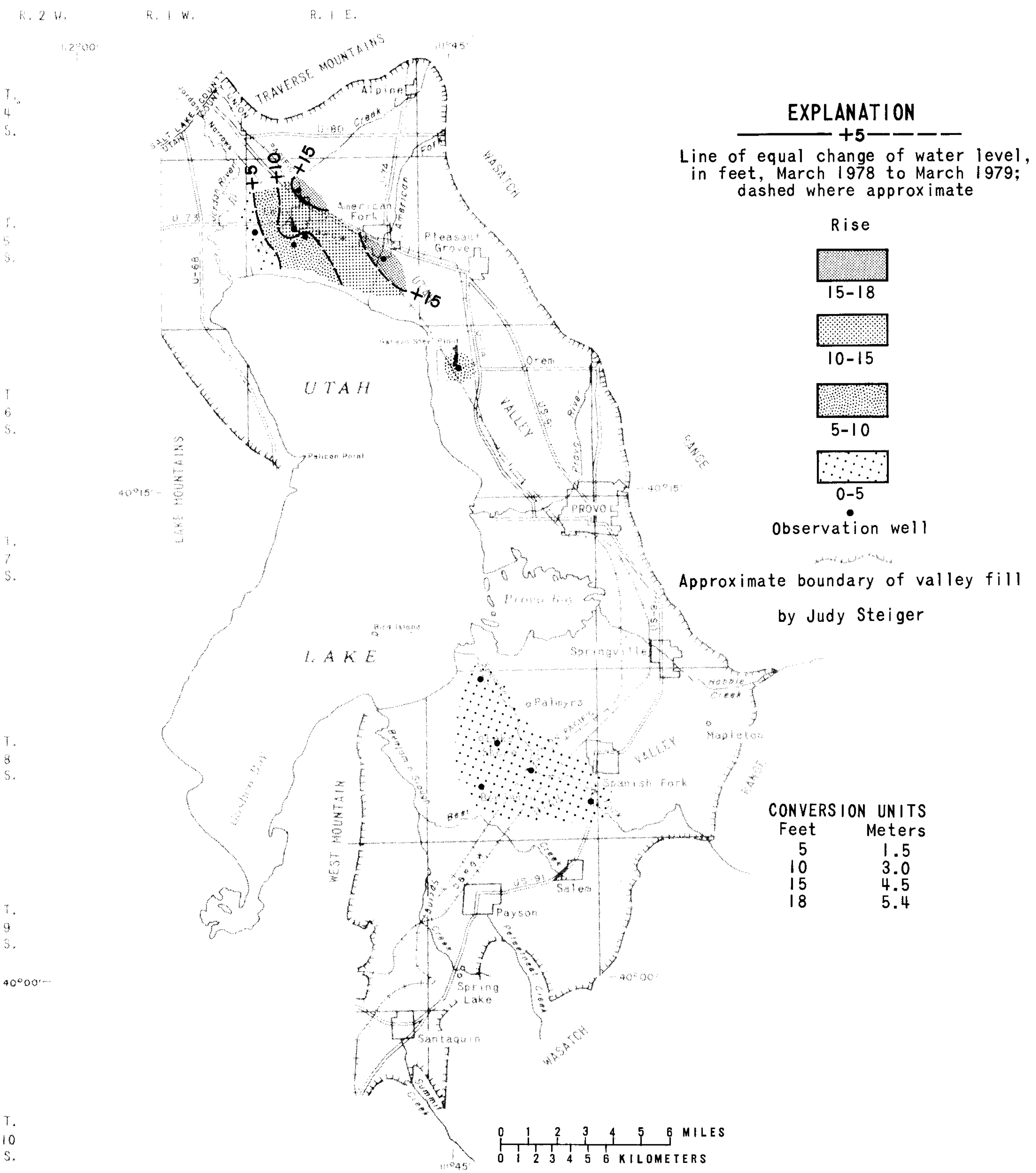


Figure 14.—Map of Utah Valley showing change of water levels in the artesian aquifer in rocks of Tertiary age from March 1978 to March 1979.

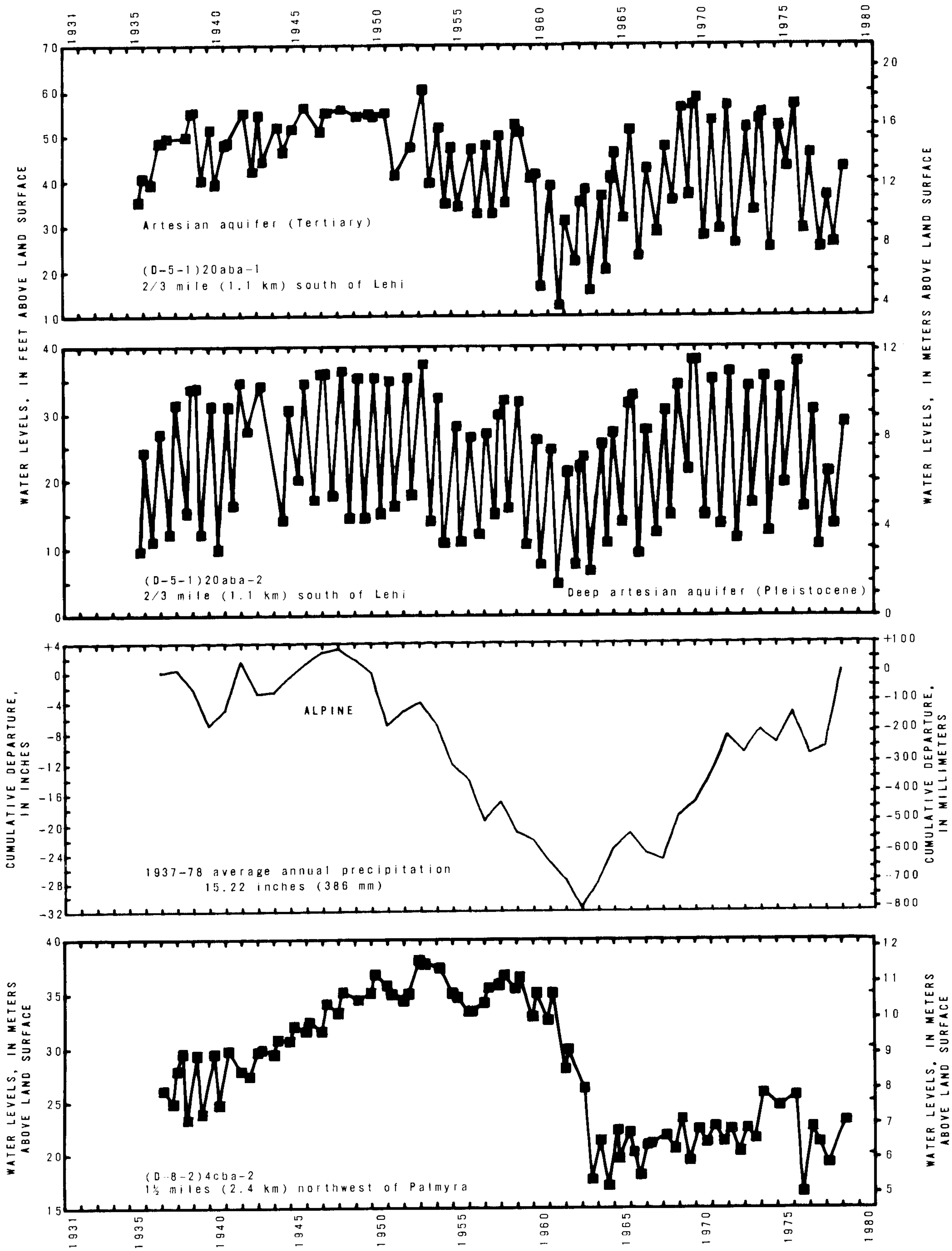
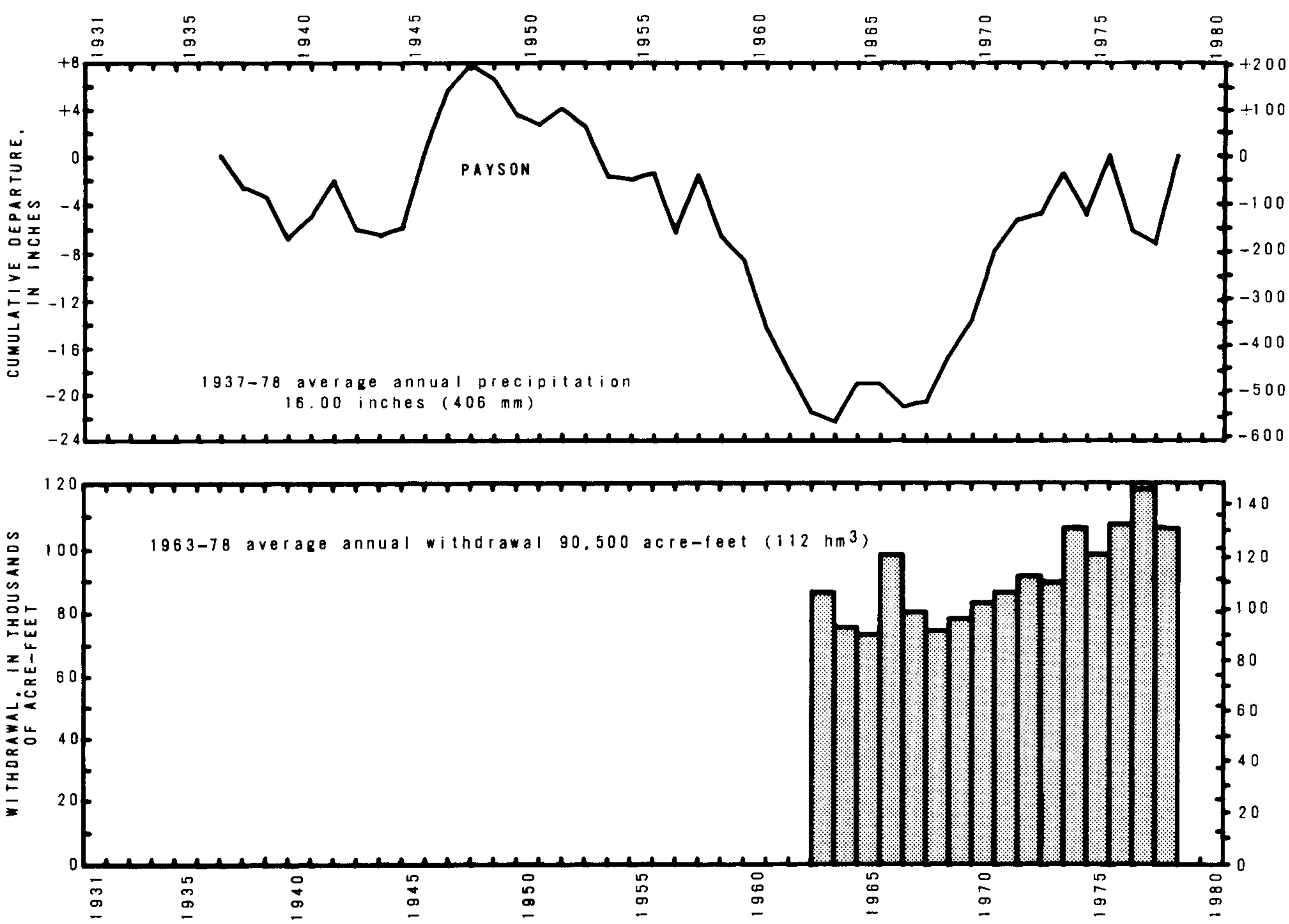


Figure 15.—Relation of water levels in selected wells to cumulative departure from the average annual precipitation at Alpine and Payson and withdrawals from wells in Utah and Goshen Valleys.



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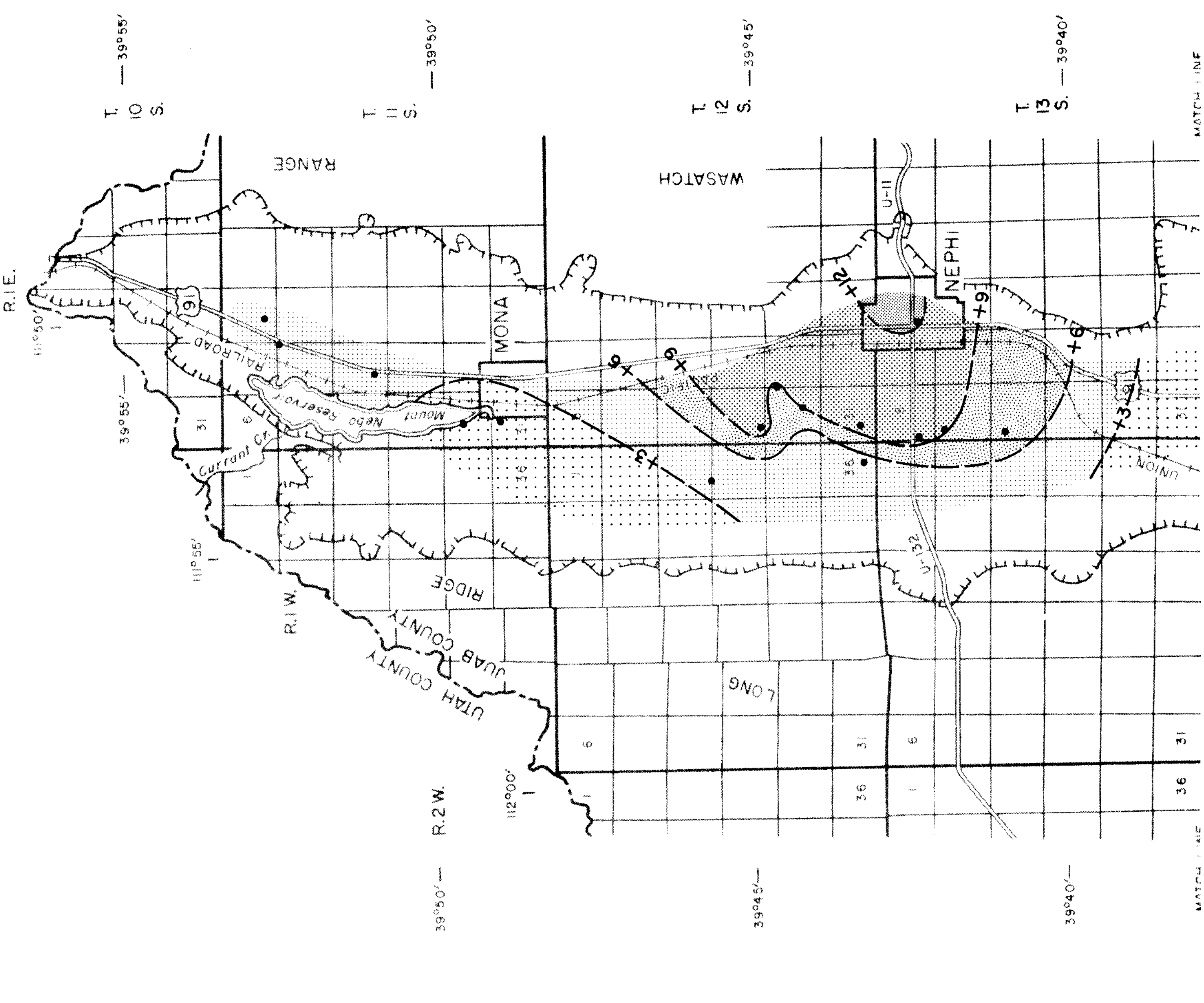

R.1 E.
R.1 W.
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T. 10 S.
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39°55'
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39°40'
111°50'
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RANGE
WASATCH
LONG
RIDGE
MONA
NEPHI
JUAB COUNTY
UTAH COUNTY
Mount Nebo Reservoir
Currant Cr.
RAILROAD
UNION
U-11
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91
+3
+6
+9
+12
MATCH LINE

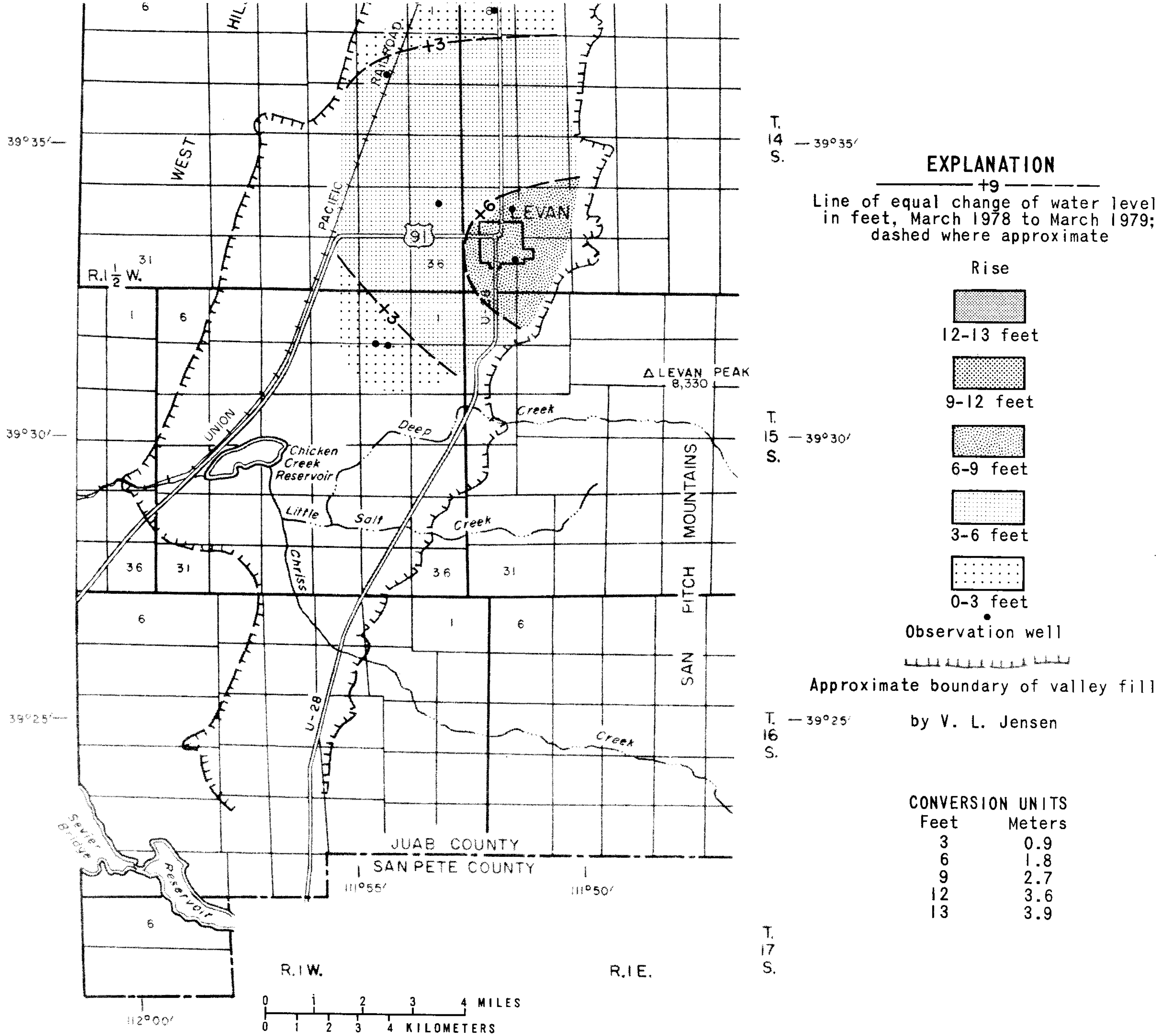


Figure 16.—Map of Juab Valley showing change of water levels from March 1978 to March 1979.

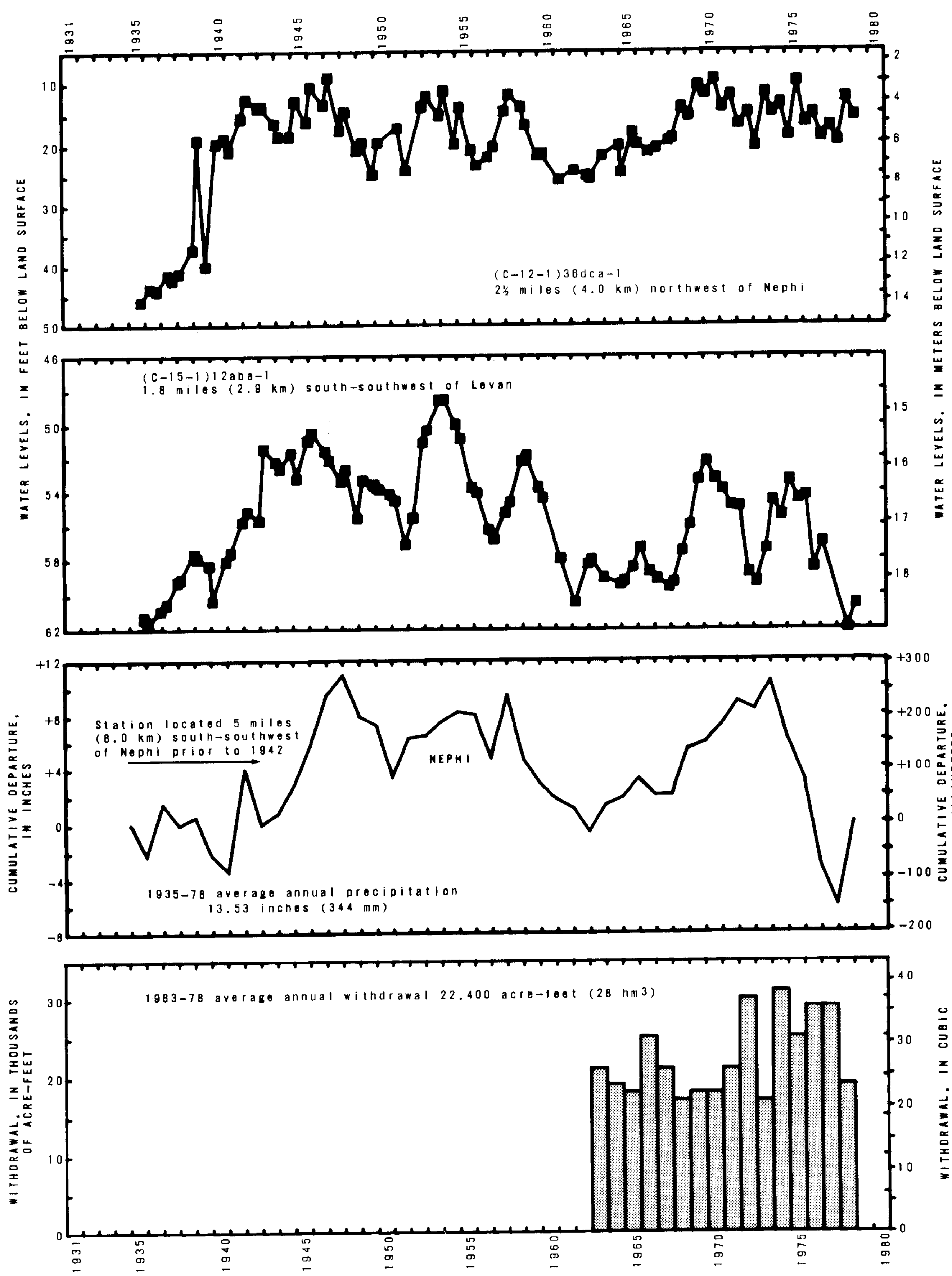


Figure 17.—Relation of water levels in selected wells in Juab Valley to cumulative departure from the average annual precipitation at Nephi and to annual withdrawals from wells.

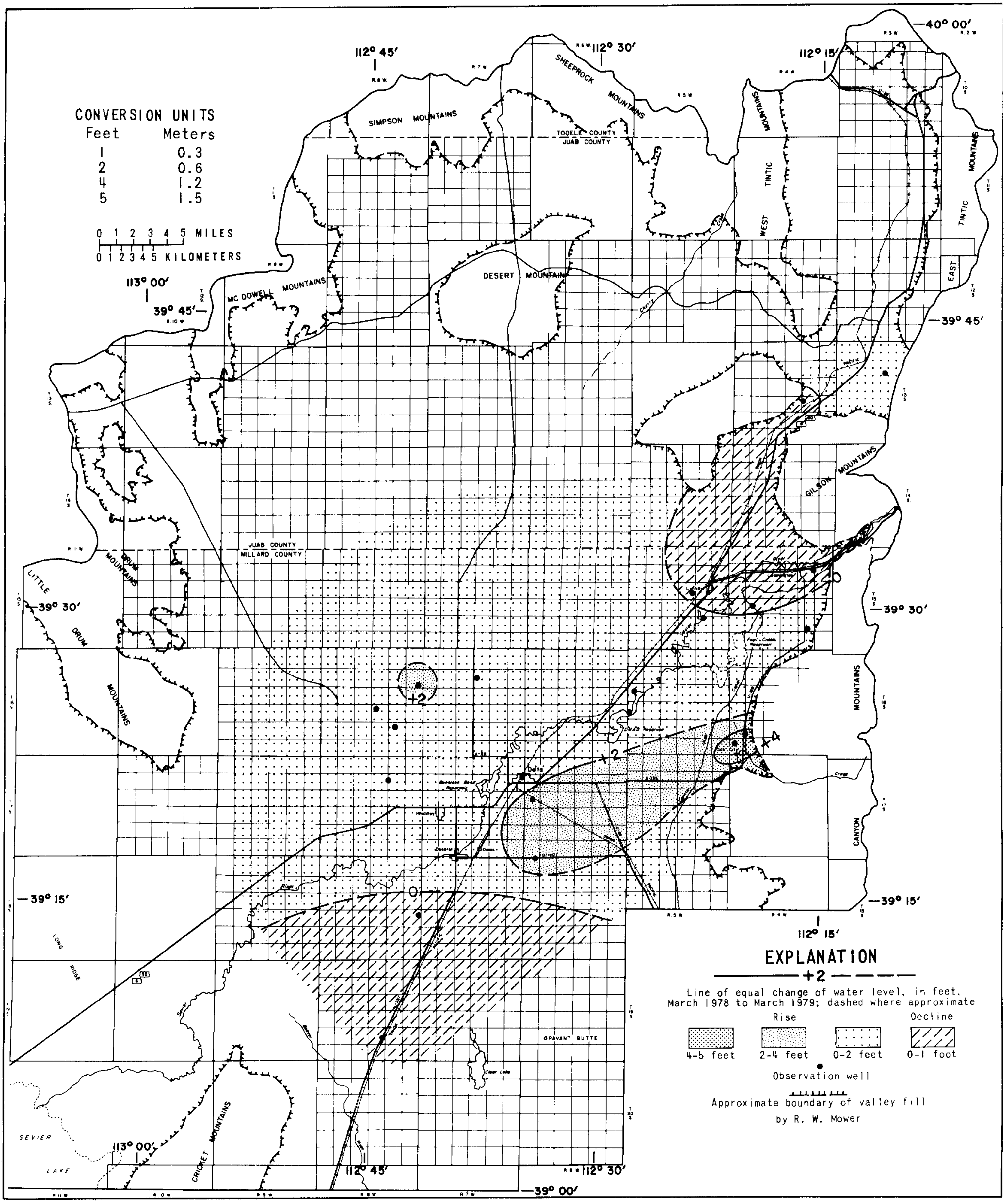


Figure 18.—Map of part of the Sevier Desert showing change of water levels in the lower artesian aquifer from March 1978 to March 1979.

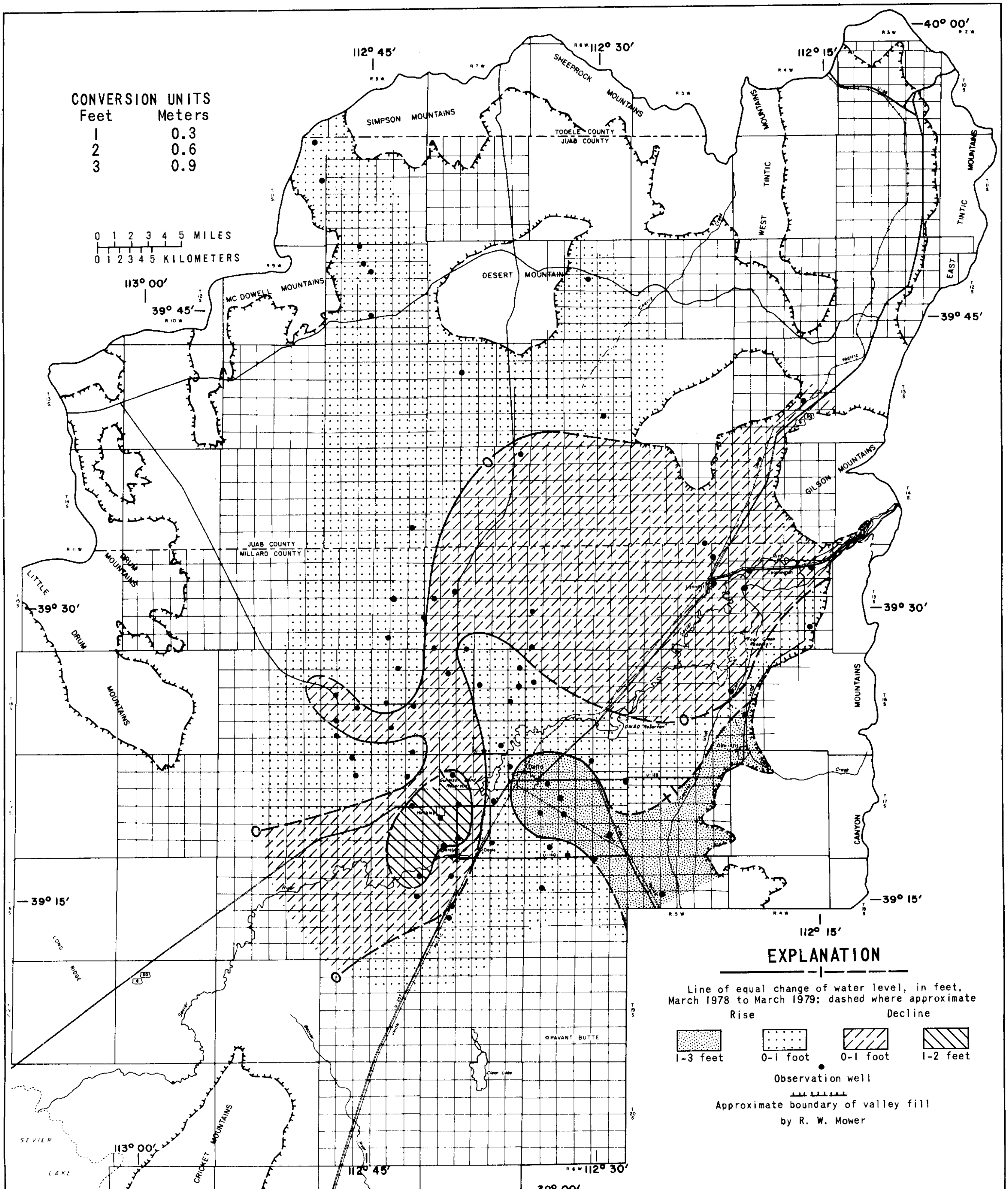


Figure 19.—Map of part of the Sevier Desert showing change of water levels in the upper artesian aquifer from March 1978 to March 1979.

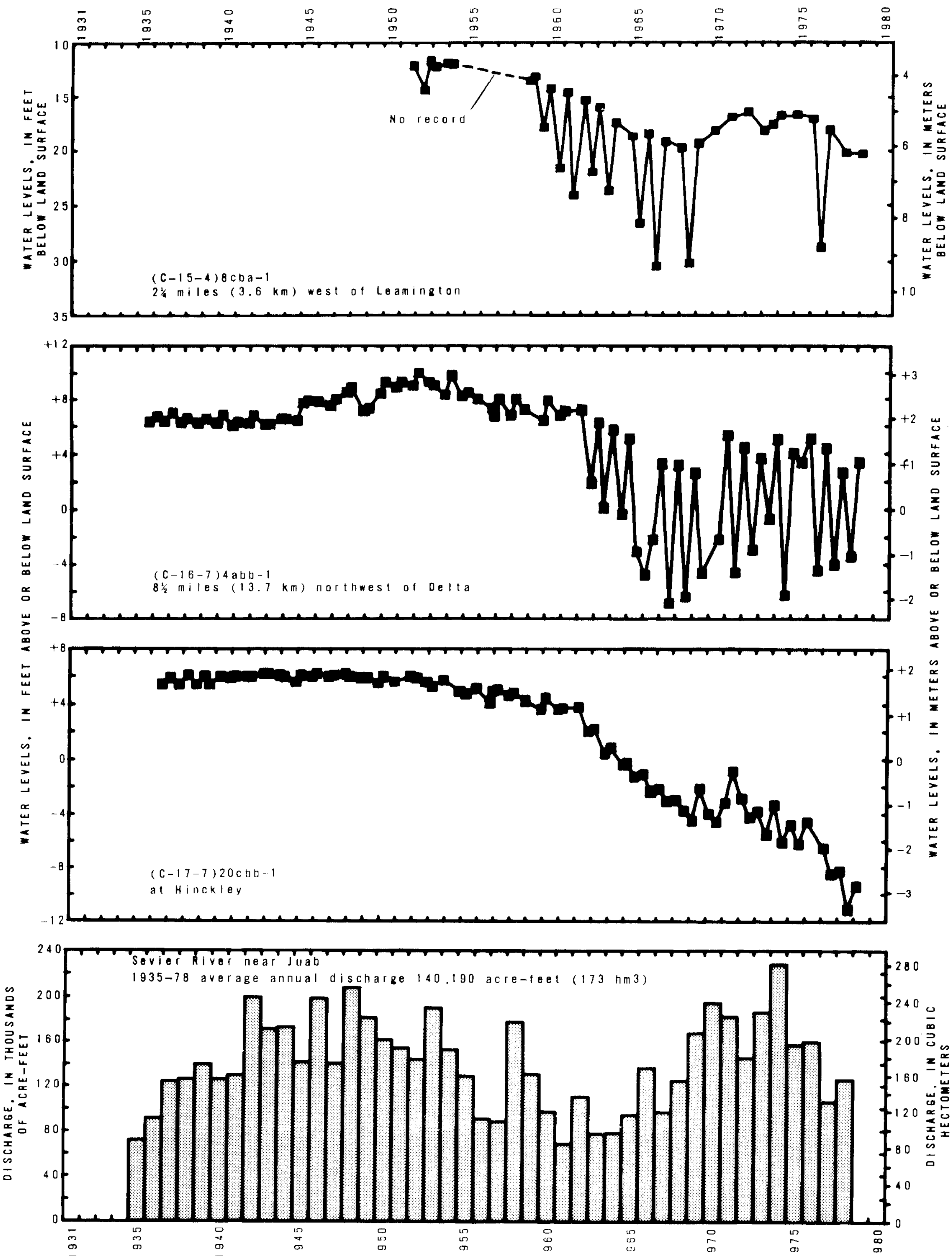
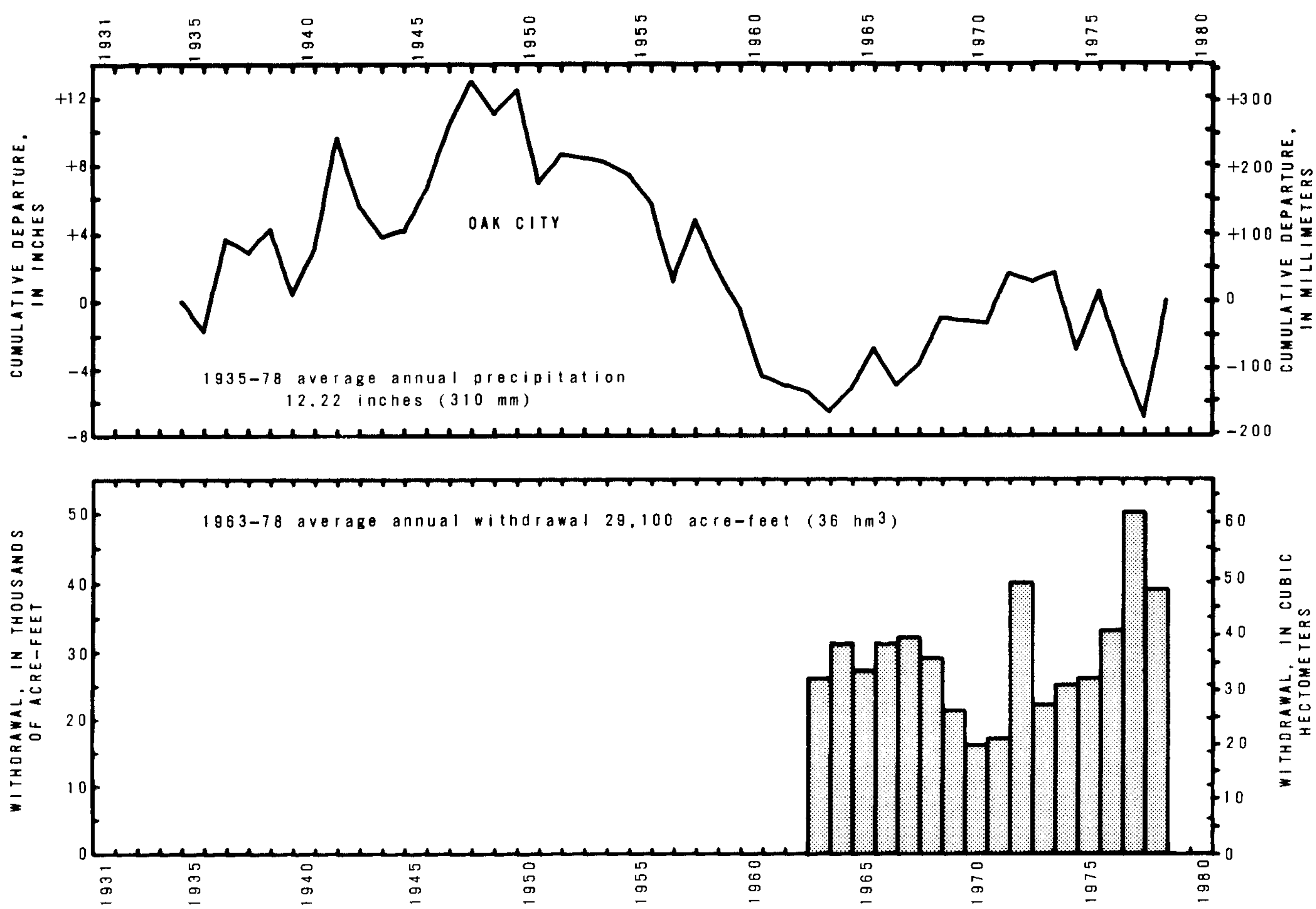


Figure 20.— Relation of water levels in selected wells in the Sevier Desert to discharge of the Sevier River near Juab, to cumulative departure from the average annual precipitation at Oak City, and to annual withdrawals from wells.



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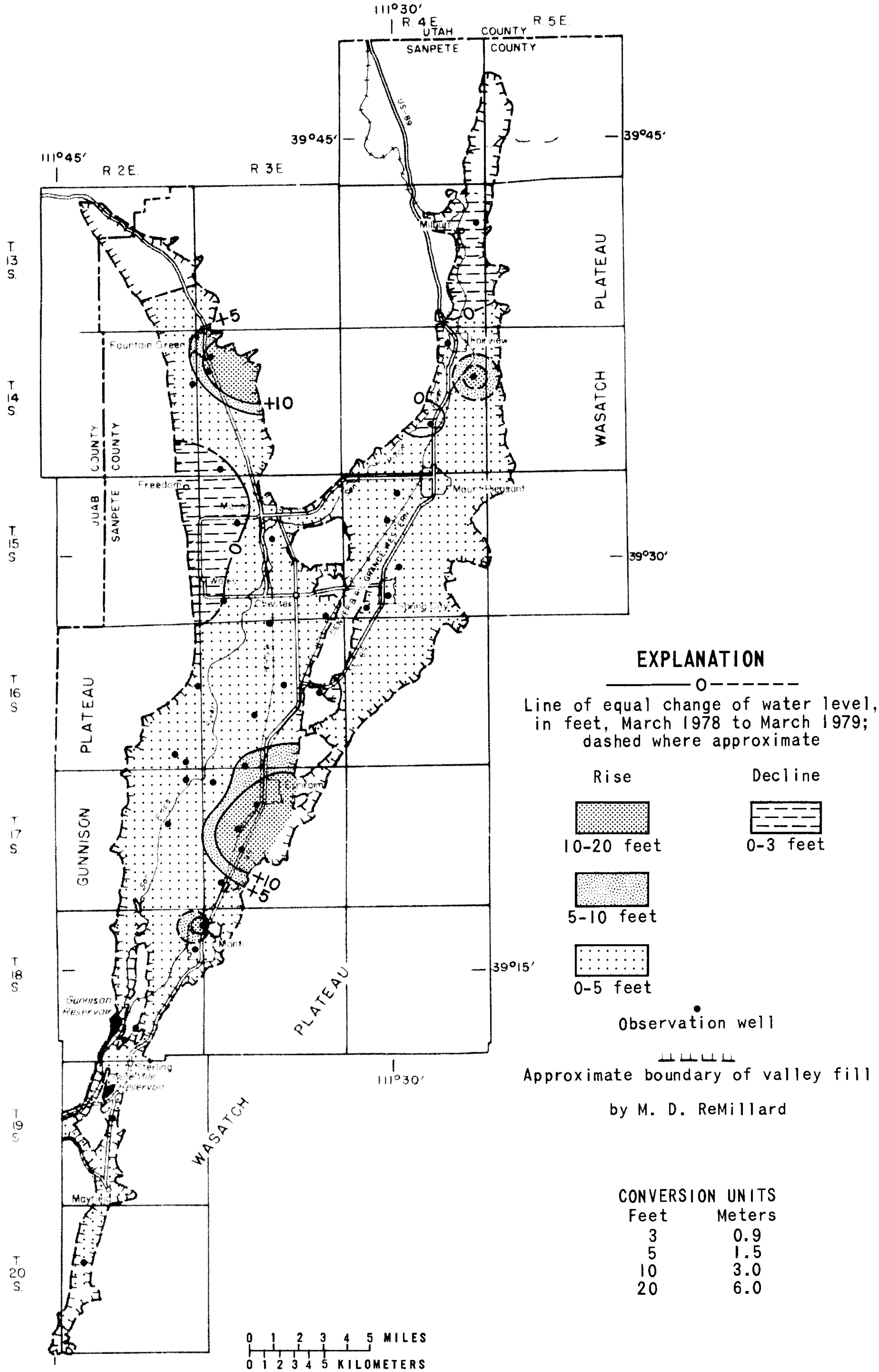


Figure 21.—Map of Sanpete Valley showing change of water levels from March 1978 to March 1979.

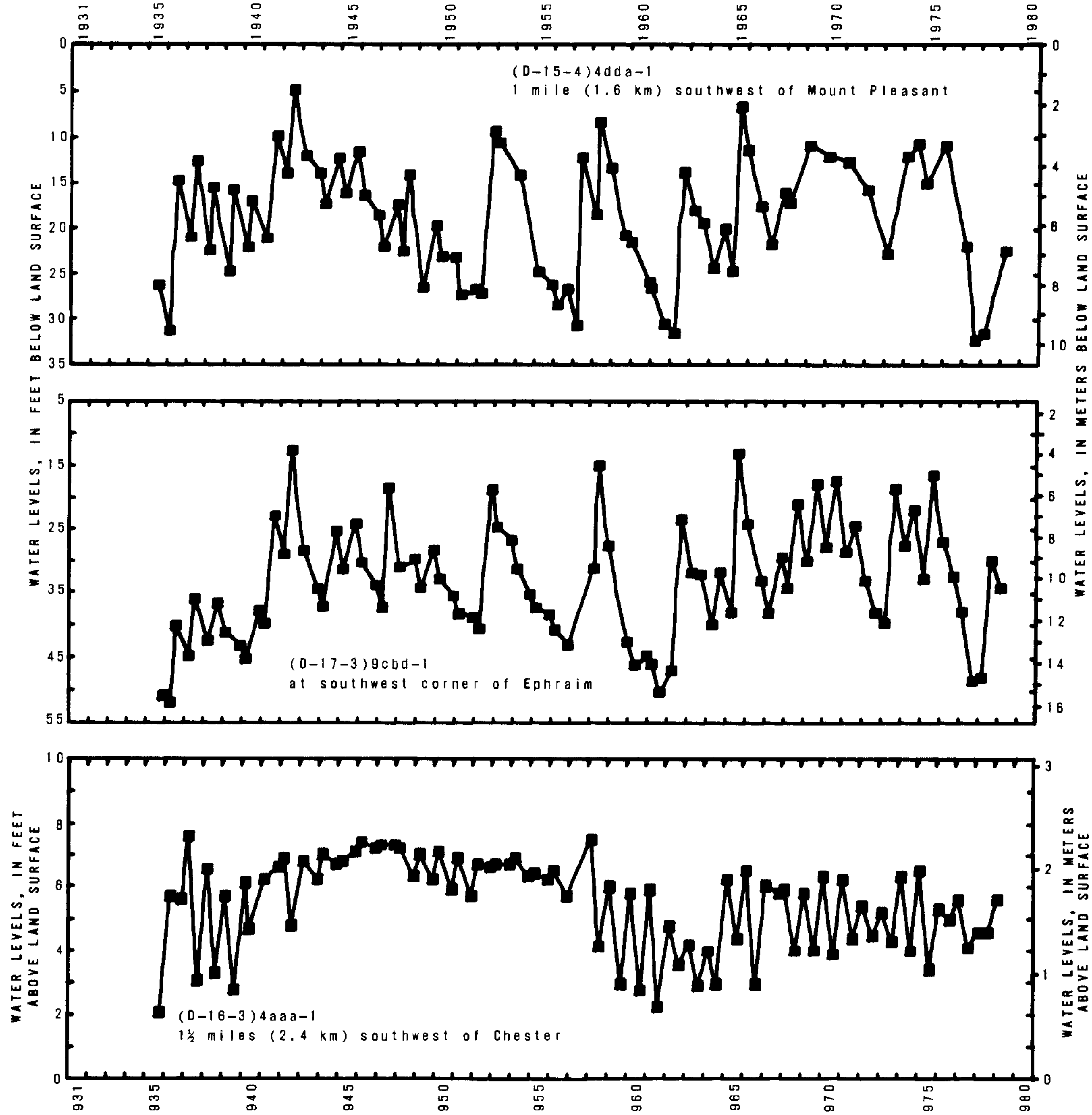
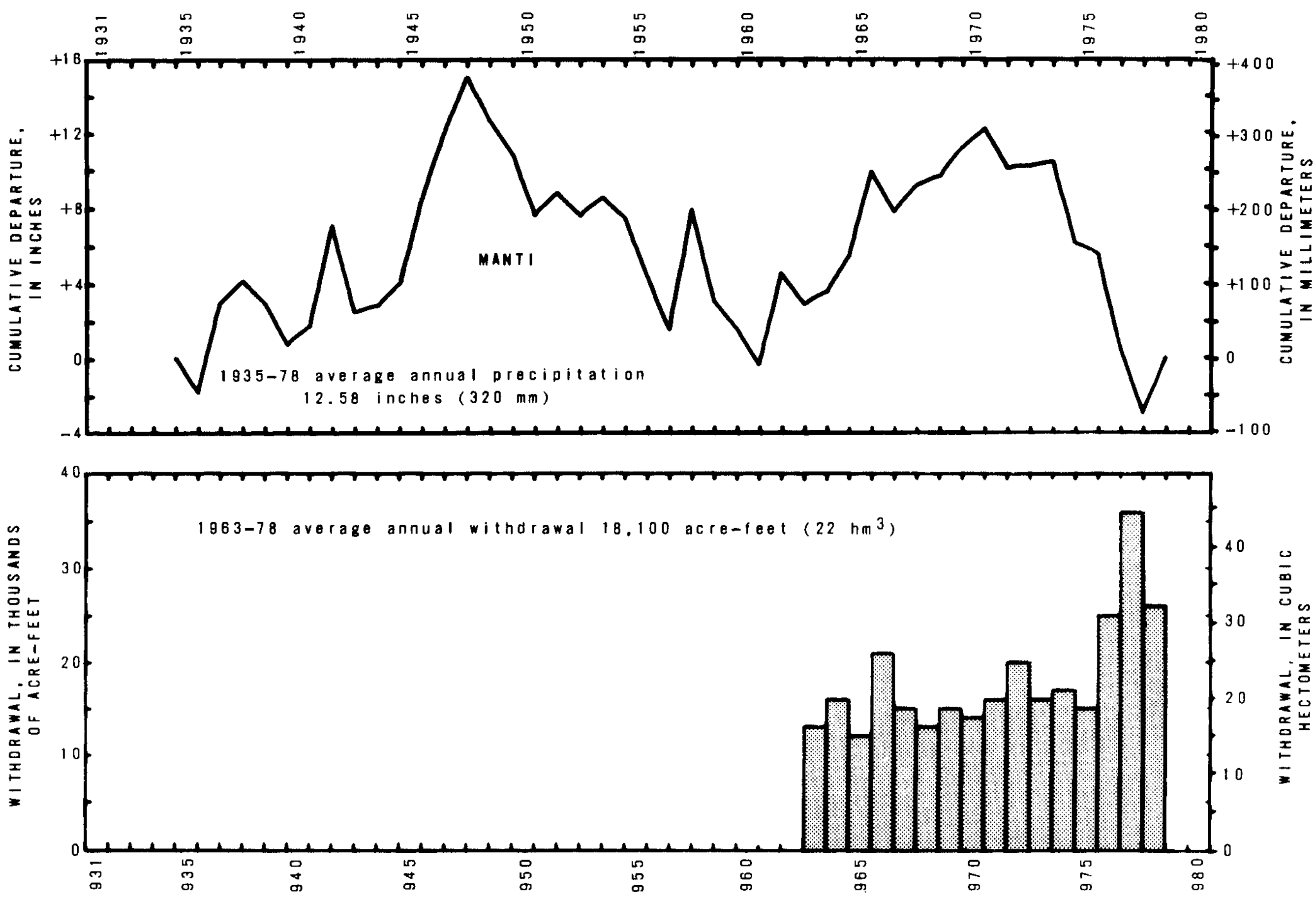


Figure 22.—Relation of water levels in selected wells in Sanpete Valley to cumulative departure from the average annual precipitation at Manti and to annual withdrawals from wells.



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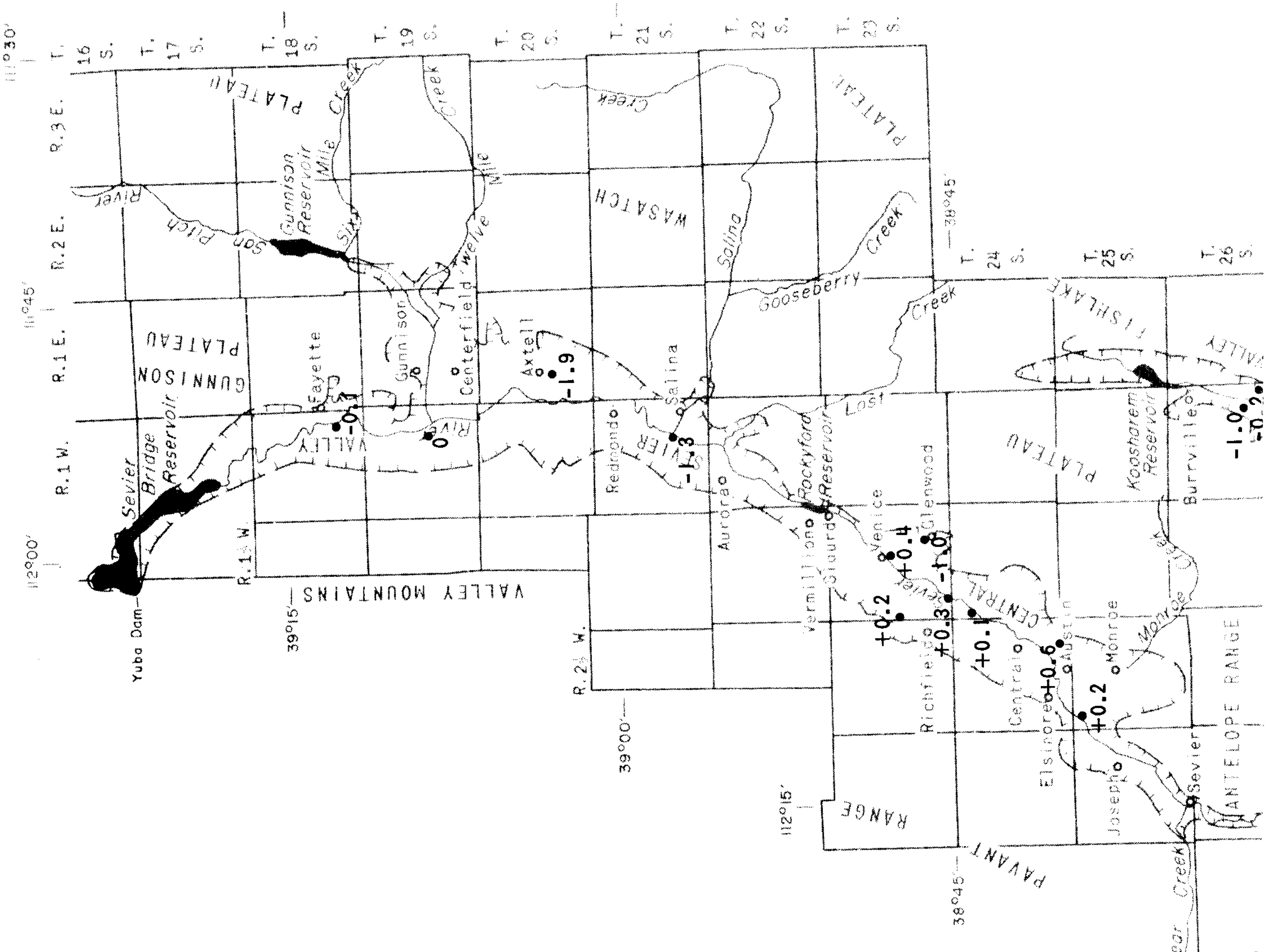

Sevier Bridge Reservoir
Yuba Dam
Gunnison Reservoir
Rockyford Reservoir
Koosharem Reservoir
San Pitch River
Sevier River
Salina Creek
Gooseberry Creek
Lost Creek
Twelve Mile Creek
Six Mile Creek
Monroe Creek
Clear Creek
GUNNISON PLATEAU
WASATCH PLATEAU
VALLEY MOUNTAINS
SEVIER VALLEY
CENTRAL
FISHLAKE
PLATEAU
PAVANT RANGE
ANTELOPE RANGE
Fayette
Gunnison
Centerfield
Axtell
Redmondo
Salina
Aurora
Vermillion
Sigurd
Venice
Glenwood
Richfield
Central
Austin
Monroe
Elsinore
Joseph
Sevier
Burrville
-1.9
-1.3
+0.4
+0.2
+0.3
+0.1
+0.6
+0.2
-1.0
R. 1 W.
R. 1 E.
R. 2 E.
R. 3 E.
R. 1½ W.
R. 2½ W.
T. 16 S.
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39°15′
39°00′
38°45′

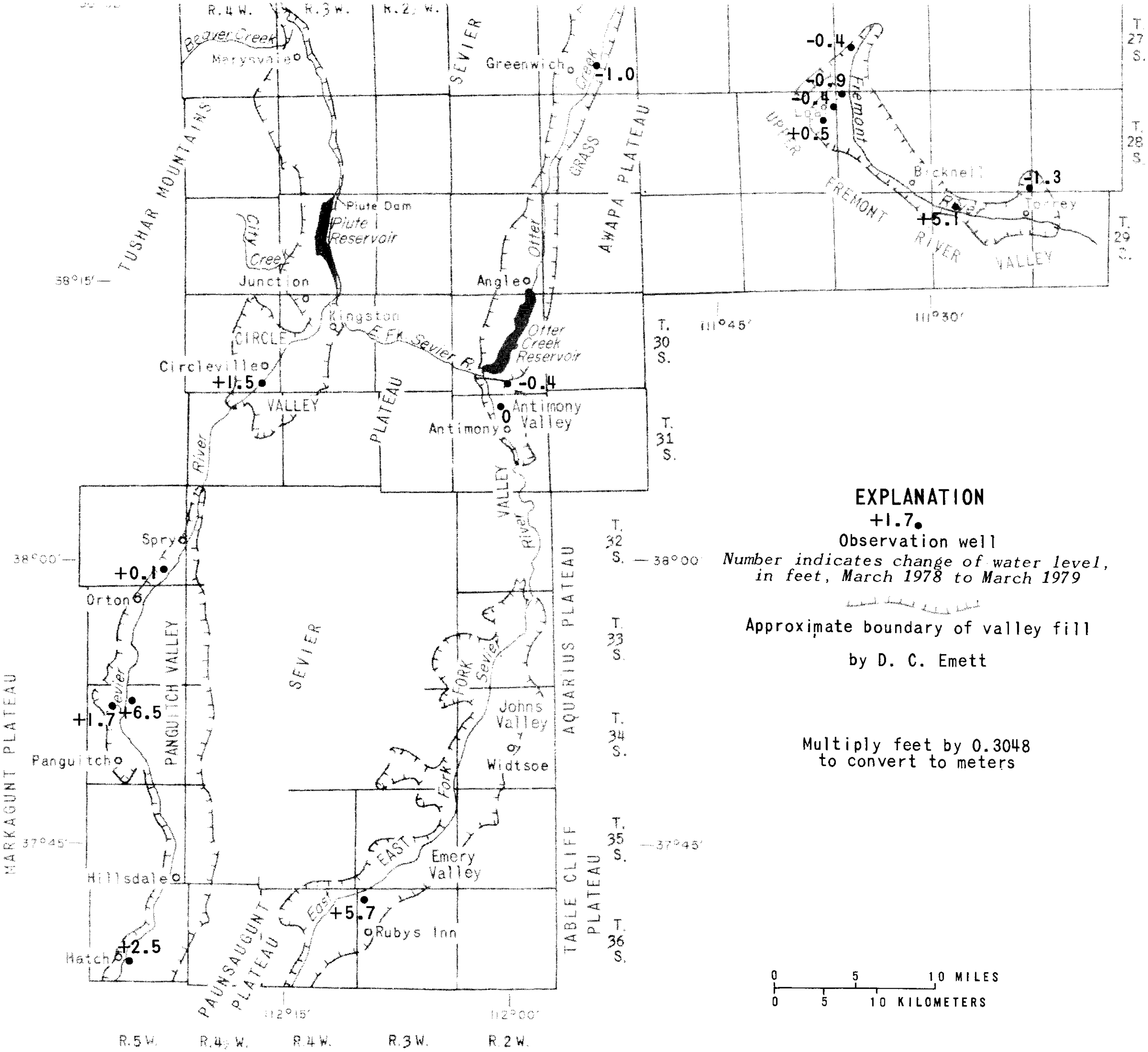


Figure 23.—Map of the upper and central Sevier Valleys and upper Fremont River valley showing change of water levels from March 1978 to March 1979.

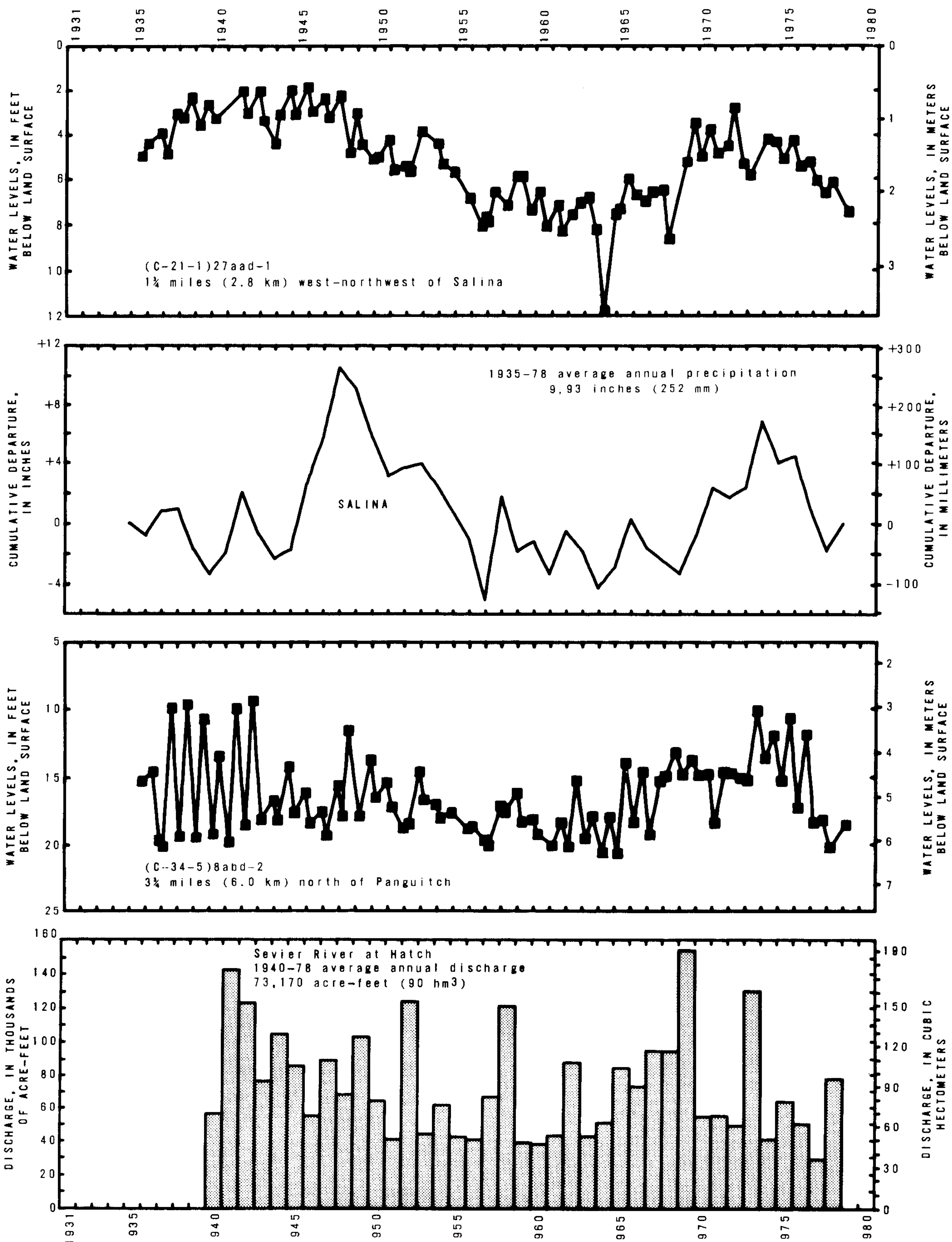
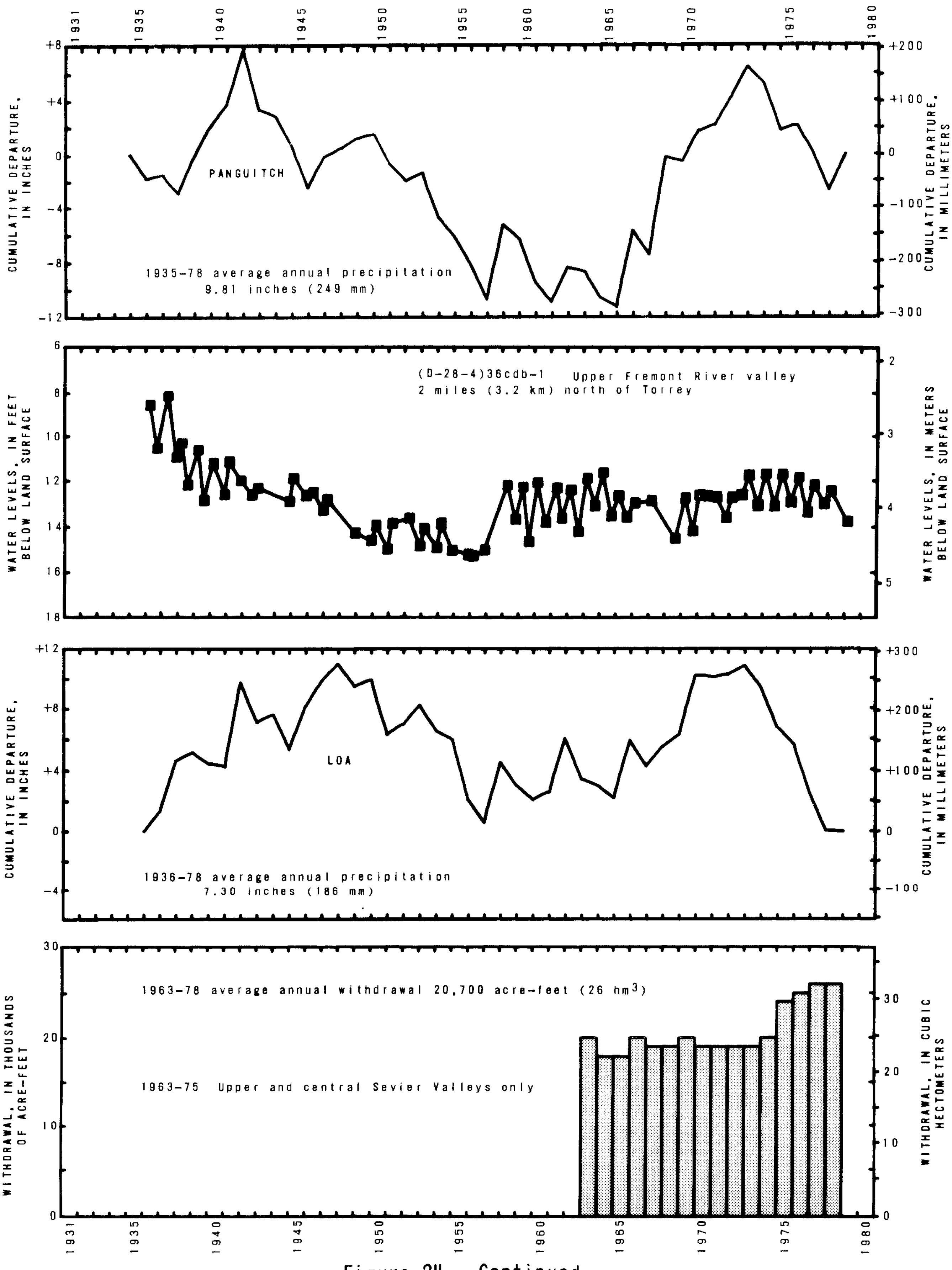


Figure 24.—Relation of water levels in selected wells to discharge of the Sevier River at Hatch, to cumulative departure from average annual precipitation at selected climate stations, and to withdrawals from wells —upper and central Sevier Valleys and upper Fremont River valley.



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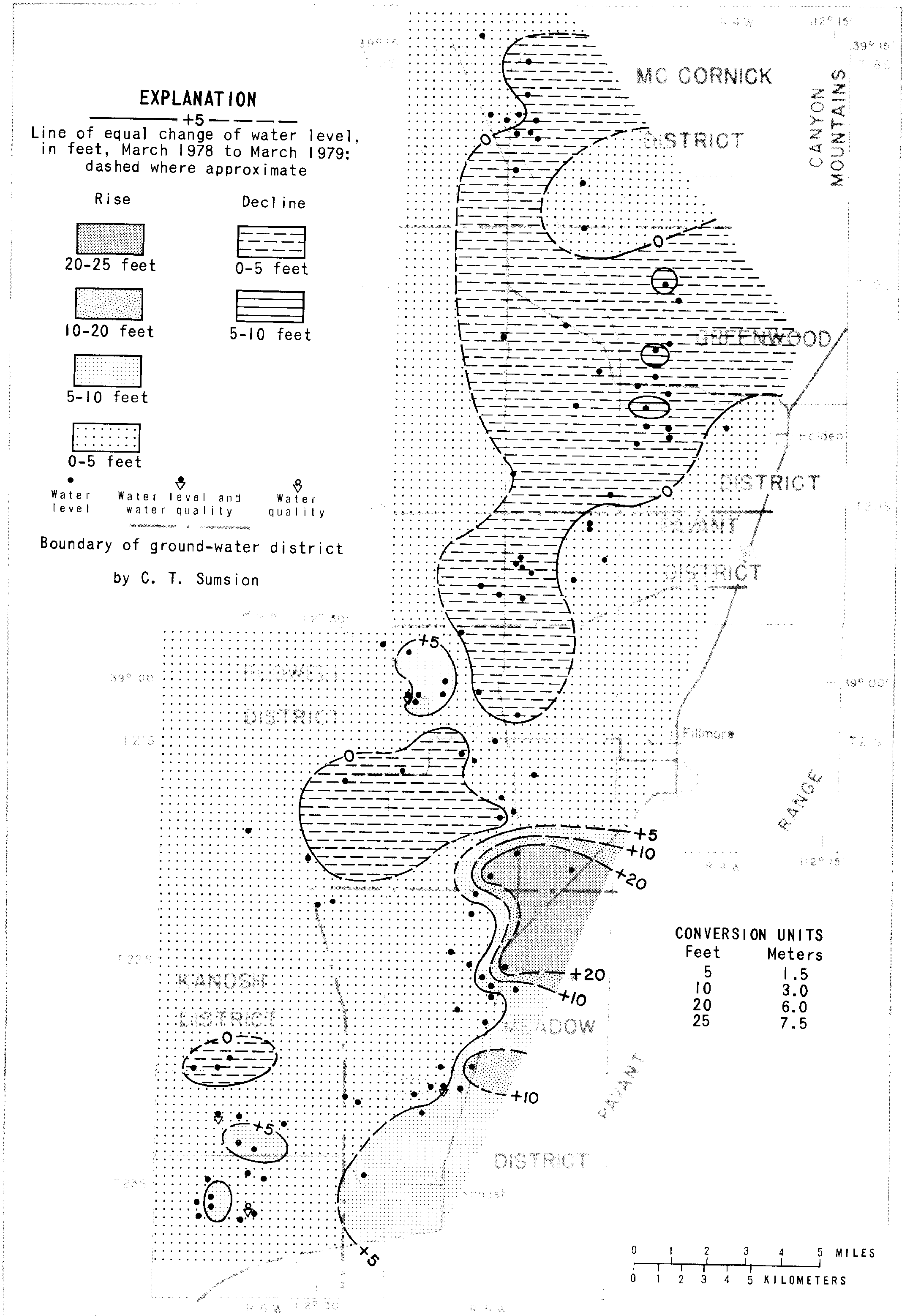


Figure 25.—Map of Pavant Valley showing change of water levels from March 1978 to March 1979.

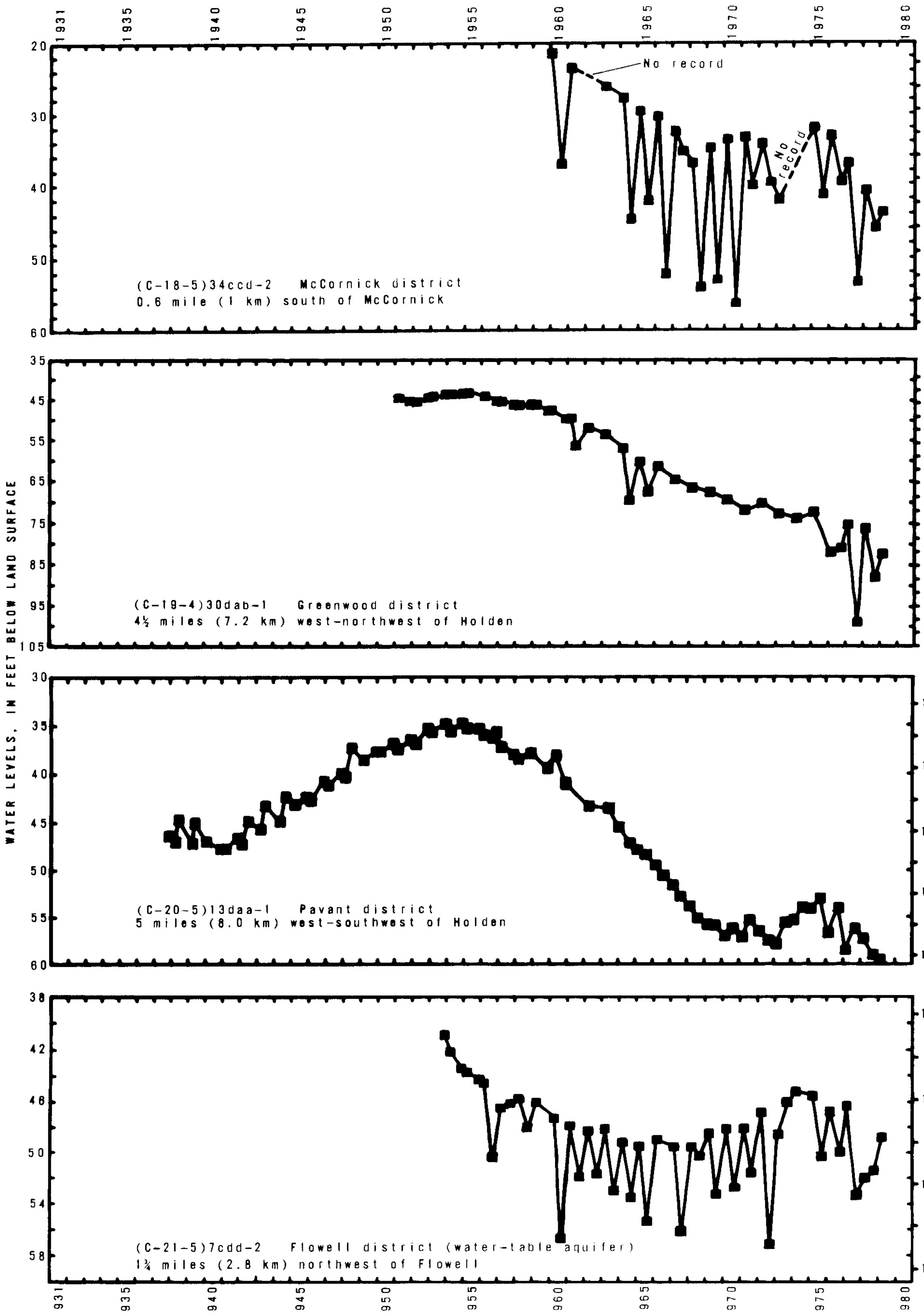
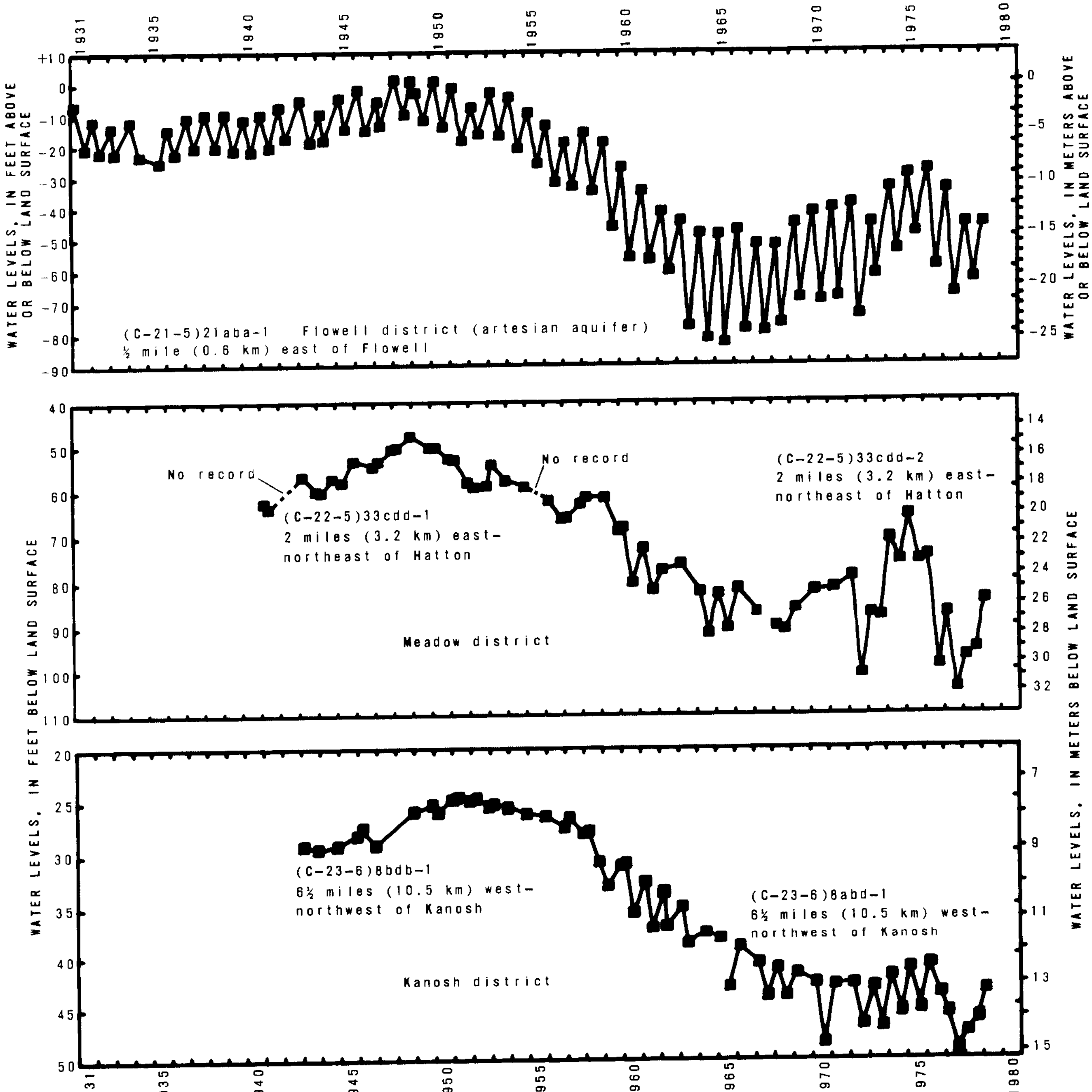


Figure 26.—Relation of water levels in selected wells in Pavant Valley to cumulative departure from the average annual precipitation at Fillmore and to annual withdrawals from wells.



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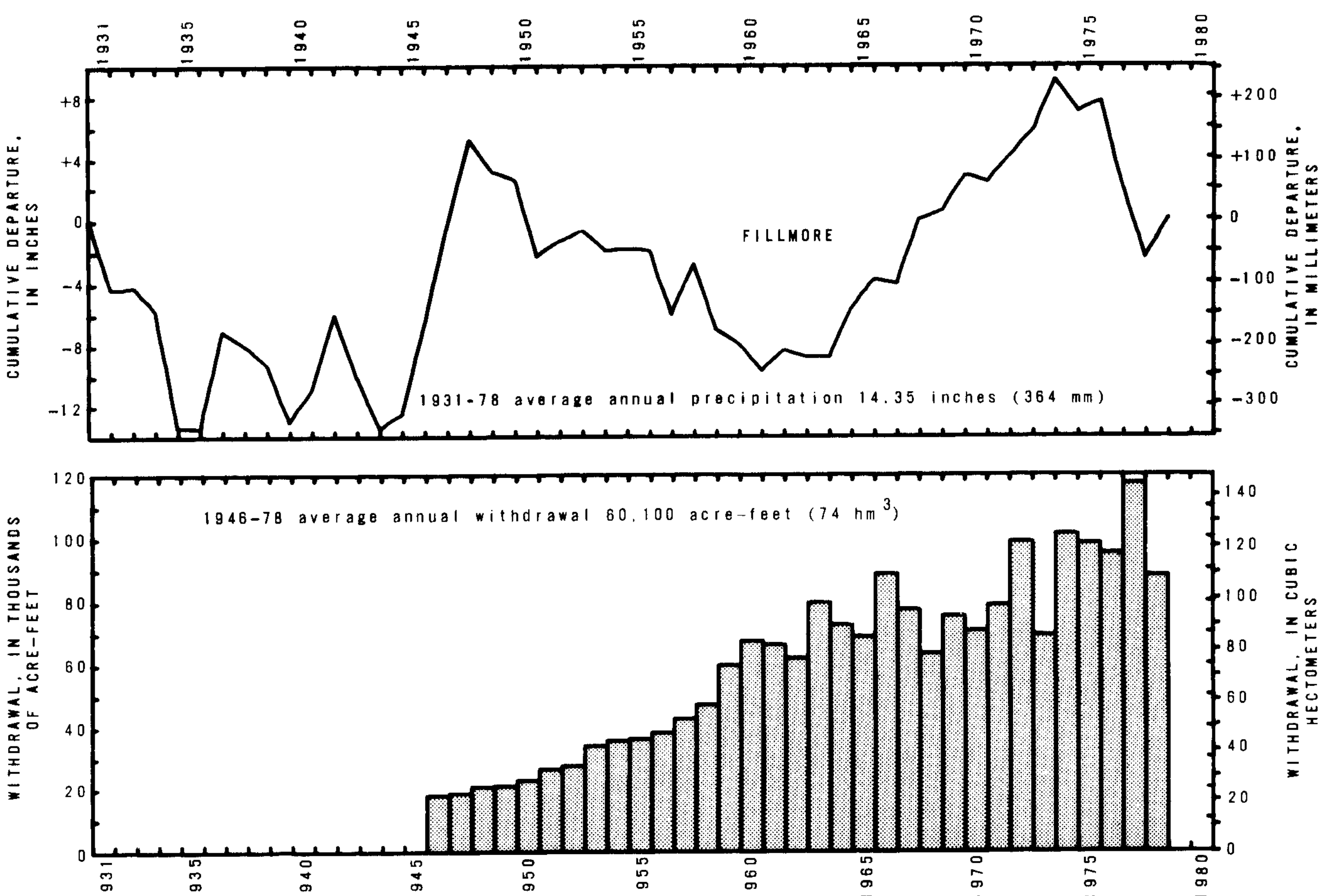

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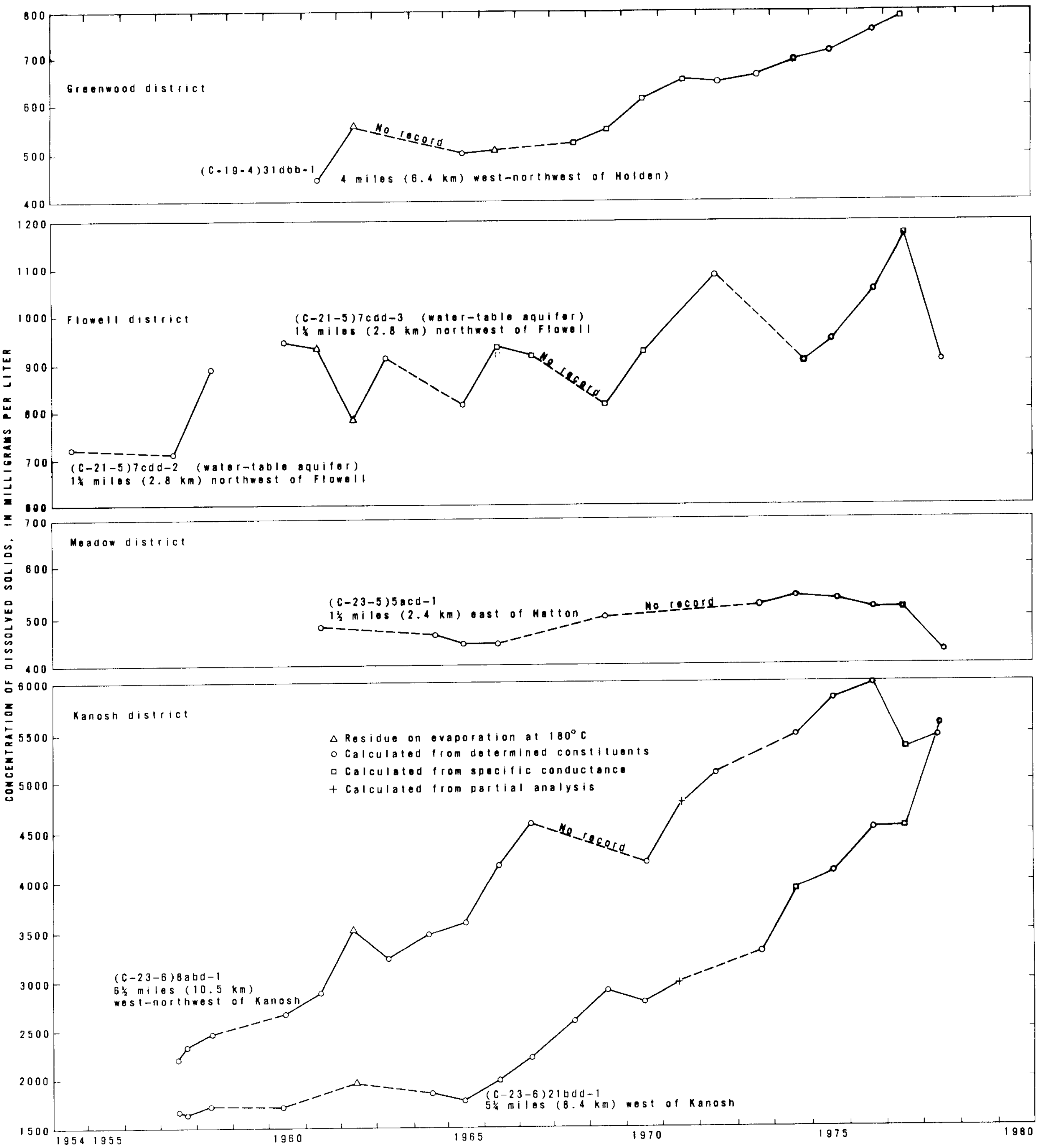

Figure 27.—Concentration of dissolved solids in water from selected wells in Pavant Valley.

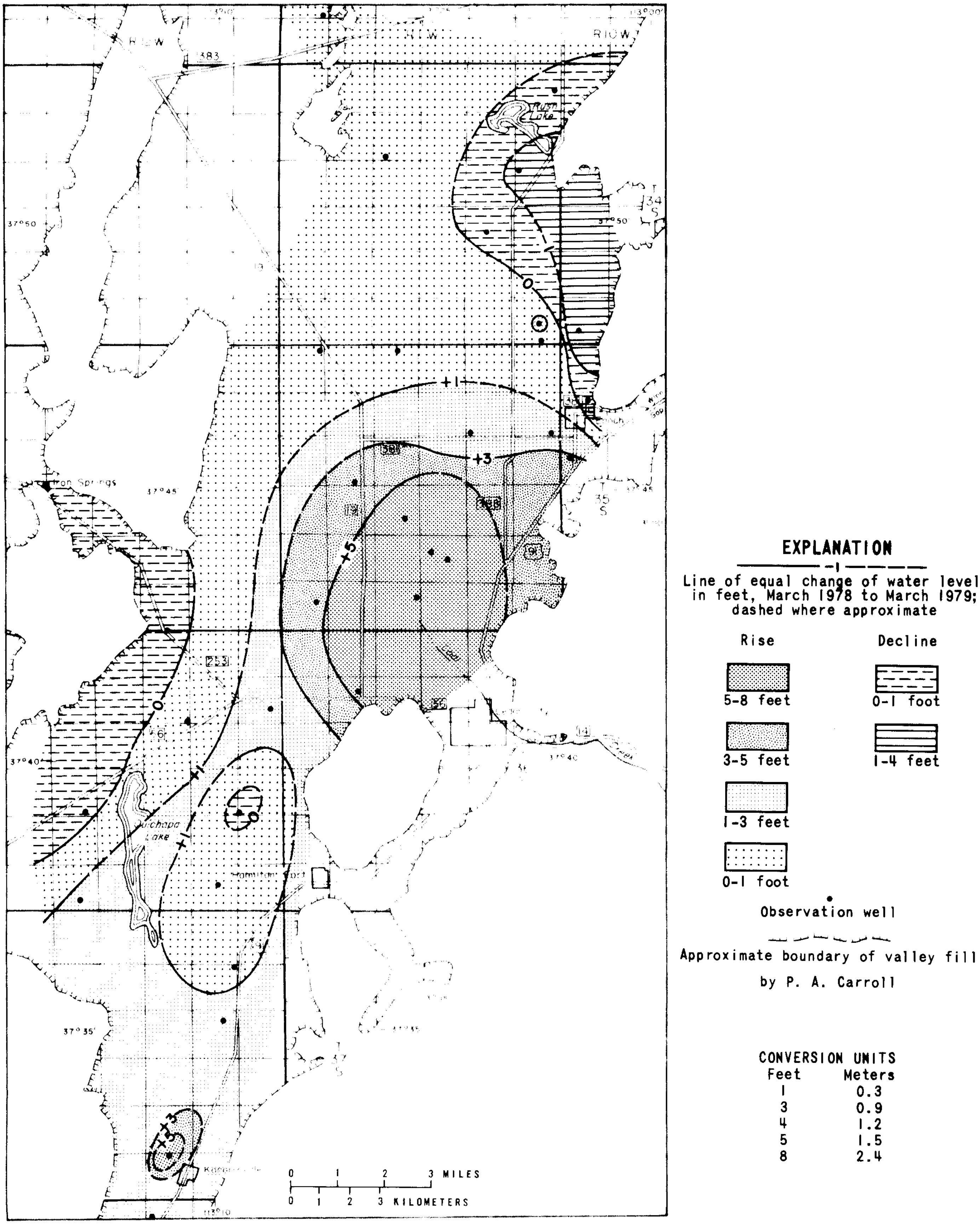

Figure 28.—Map of Cedar City Valley showing change of water levels from March 1978 to March 1979.

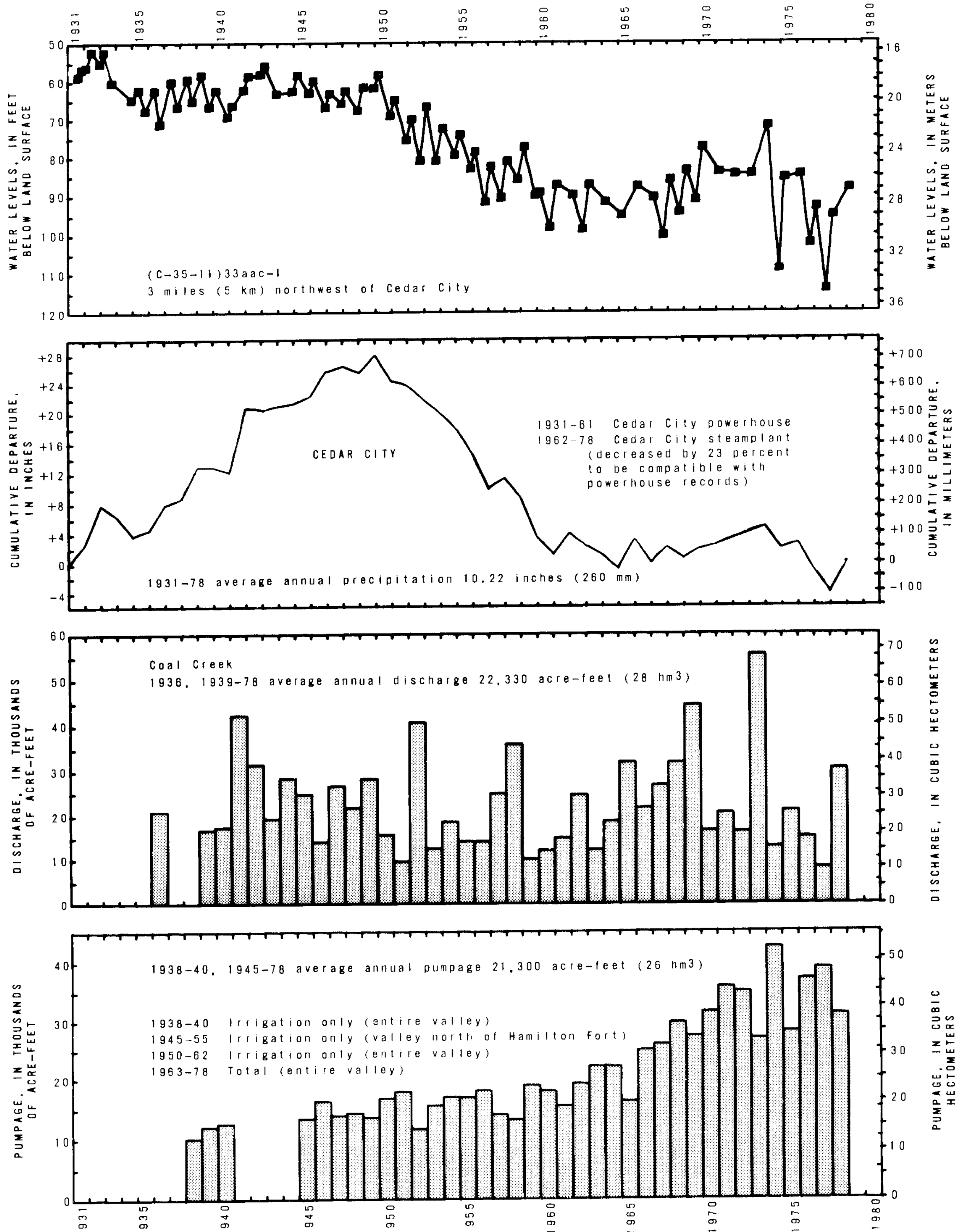

Figure 29.—Relation of water levels in well (C-35-11)33aac-1 in Cedar City Valley to cumulative departure from the average annual precipitation at the Cedar City powerhouse, to discharge of Coal Creek near Cedar City, and to annual withdrawals from wells.

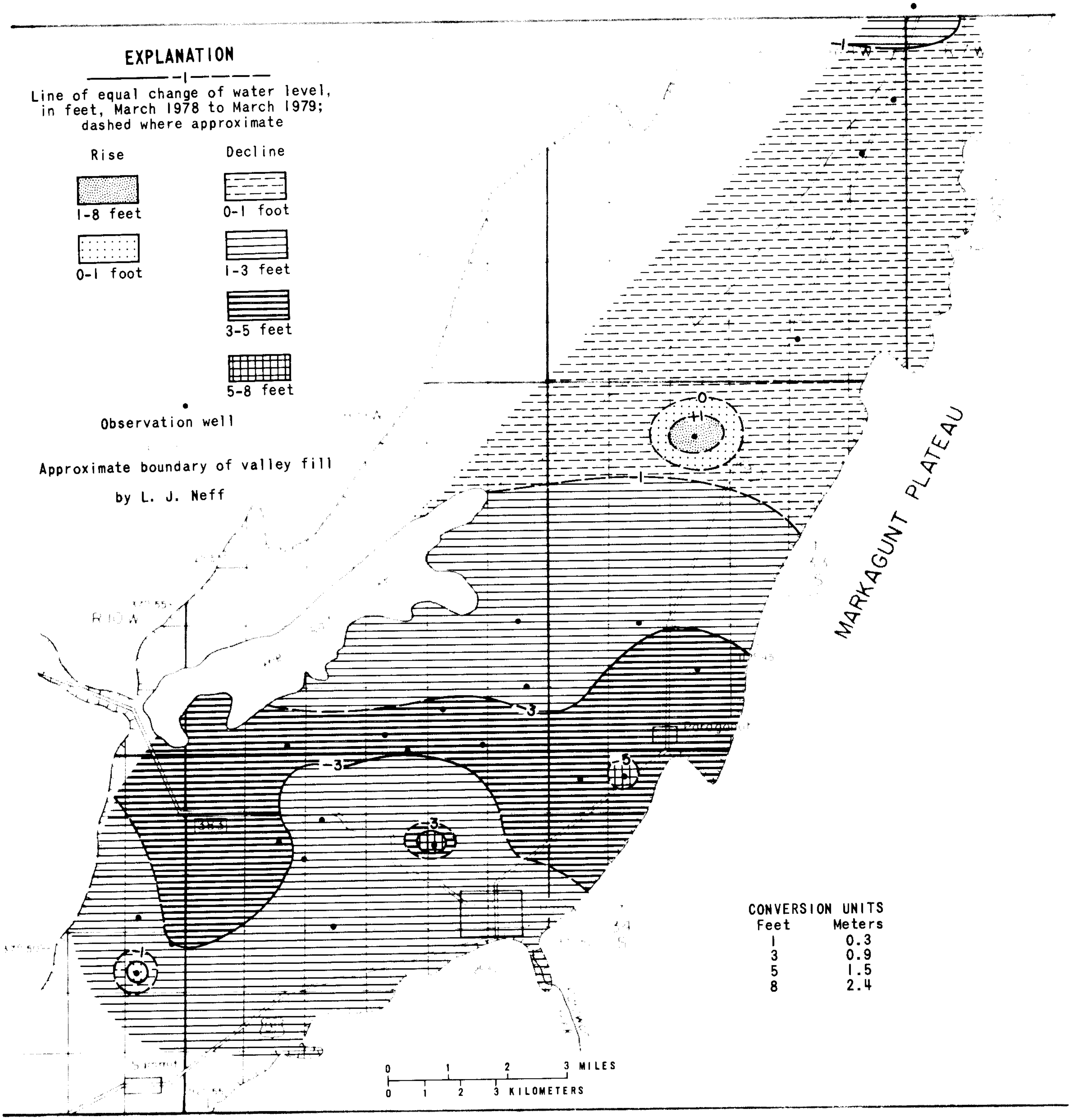

Figure 30.—Map of Parowan Valley showing change of water levels from March 1978 to March 1979.

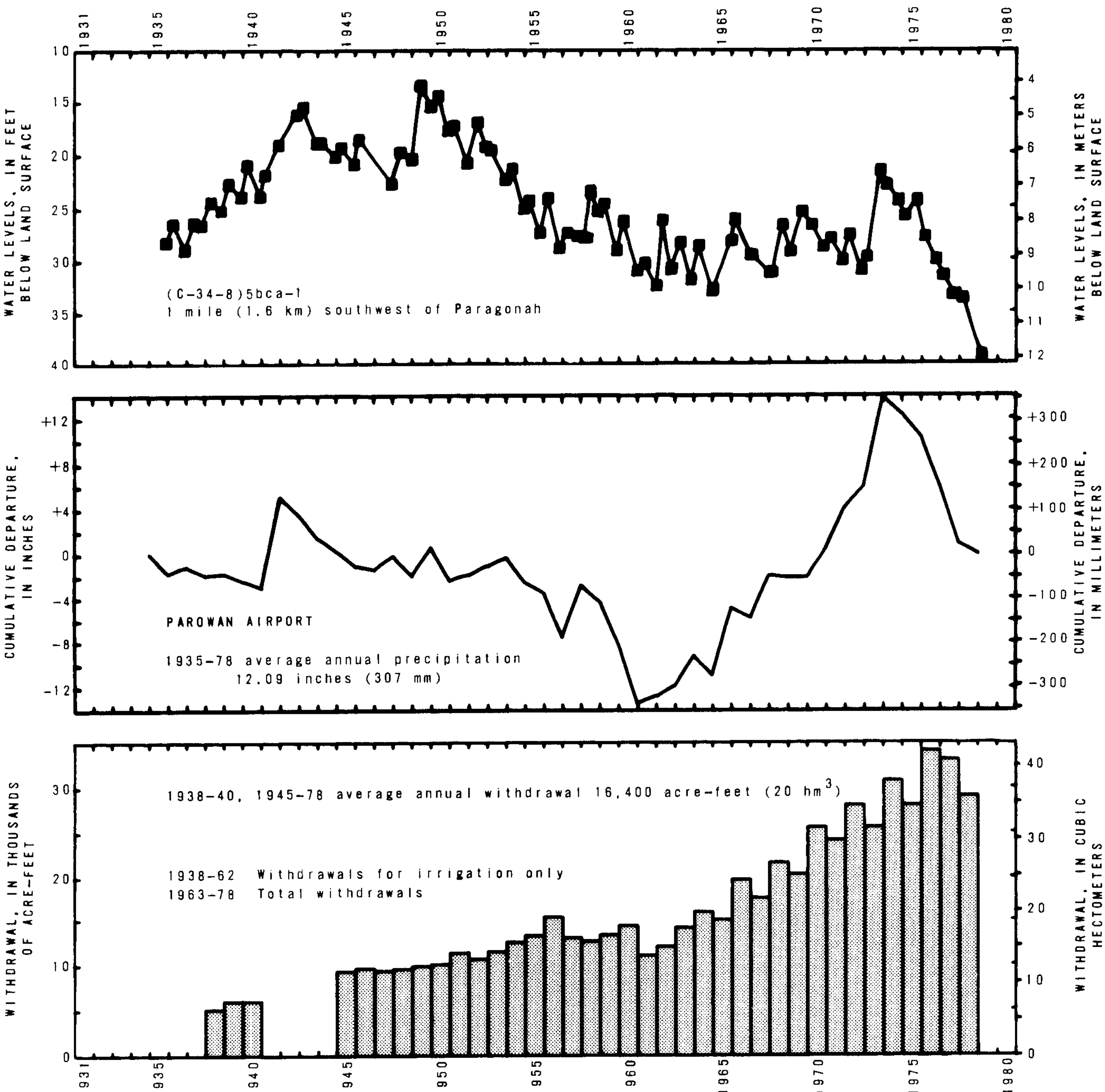

Figure 31.—Relation of water levels in well (C-34-8)5bca-1 in Parowan Valley to cumulative departure from the average annual precipitation at Parowan Airport and to annual withdrawals from wells.

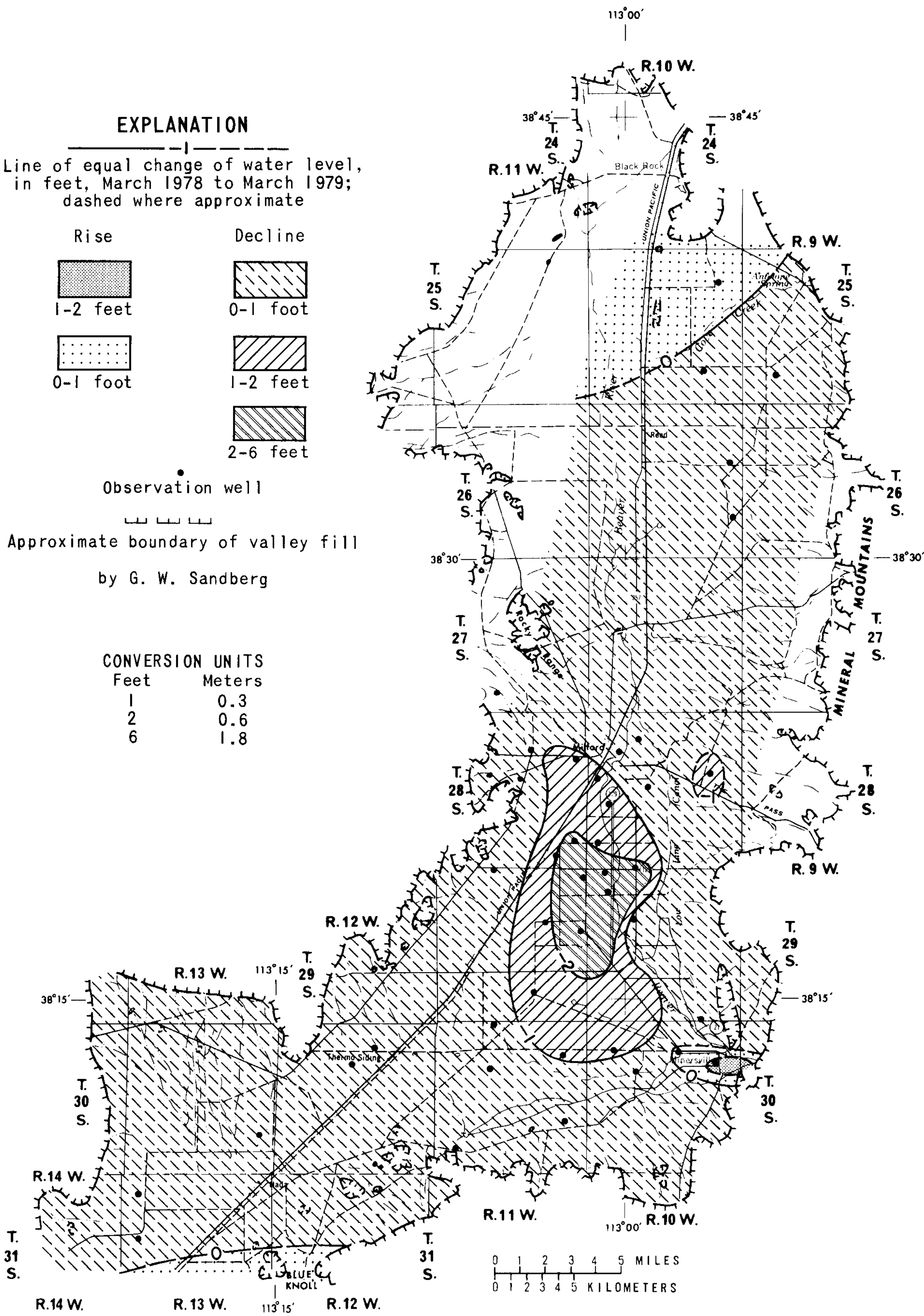

Figure 32.—Map of the Milford area, Escalante Valley, showing change of water levels from March 1978 to March 1979.

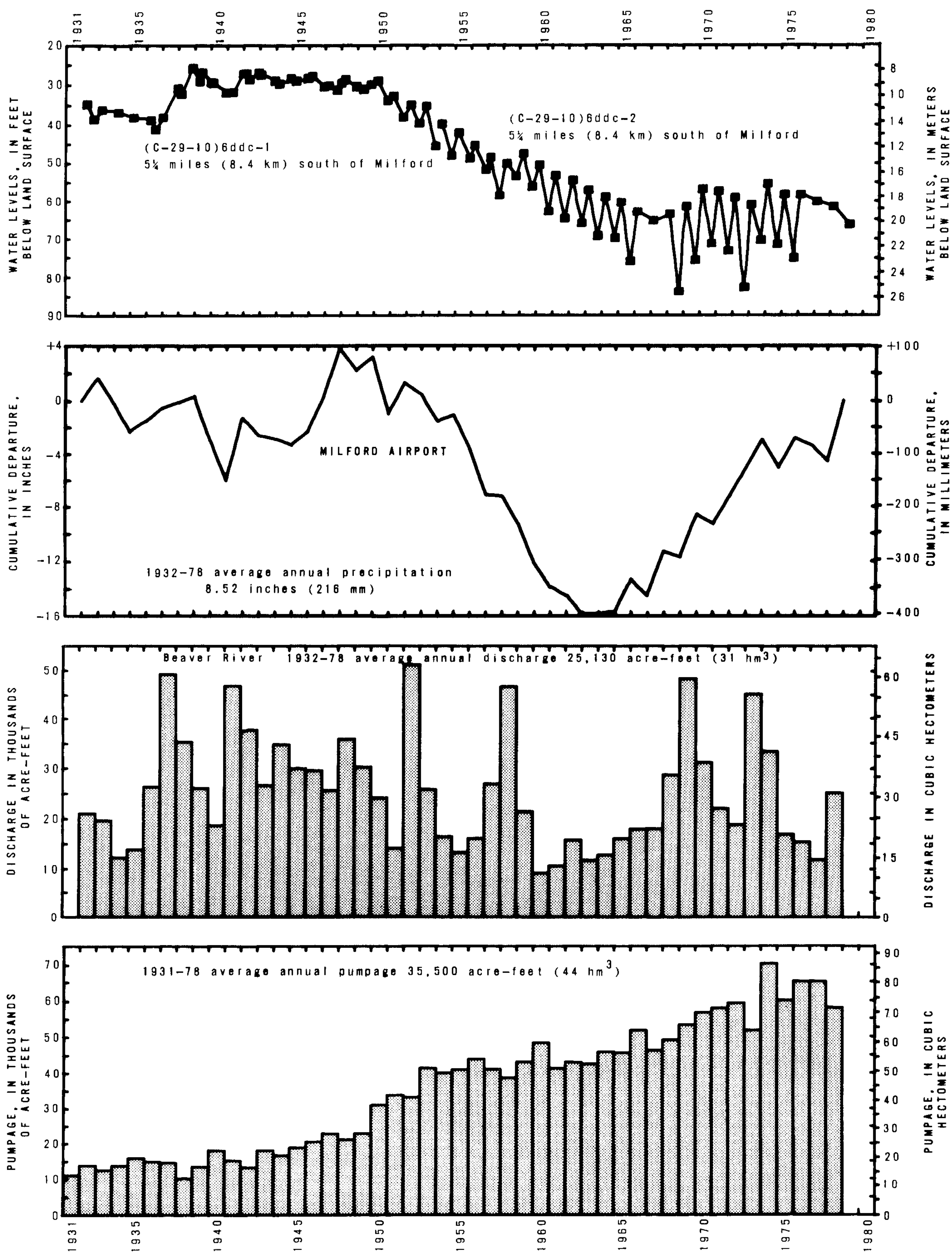

Figure 33.—Relation of water levels in selected wells in the Milford area, Escalante Valley, to cumulative departure from the average annual precipitation at Milford Airport, to discharge of the Beaver River at Rocky Ford Dam, and to annual pumpage for irrigation.

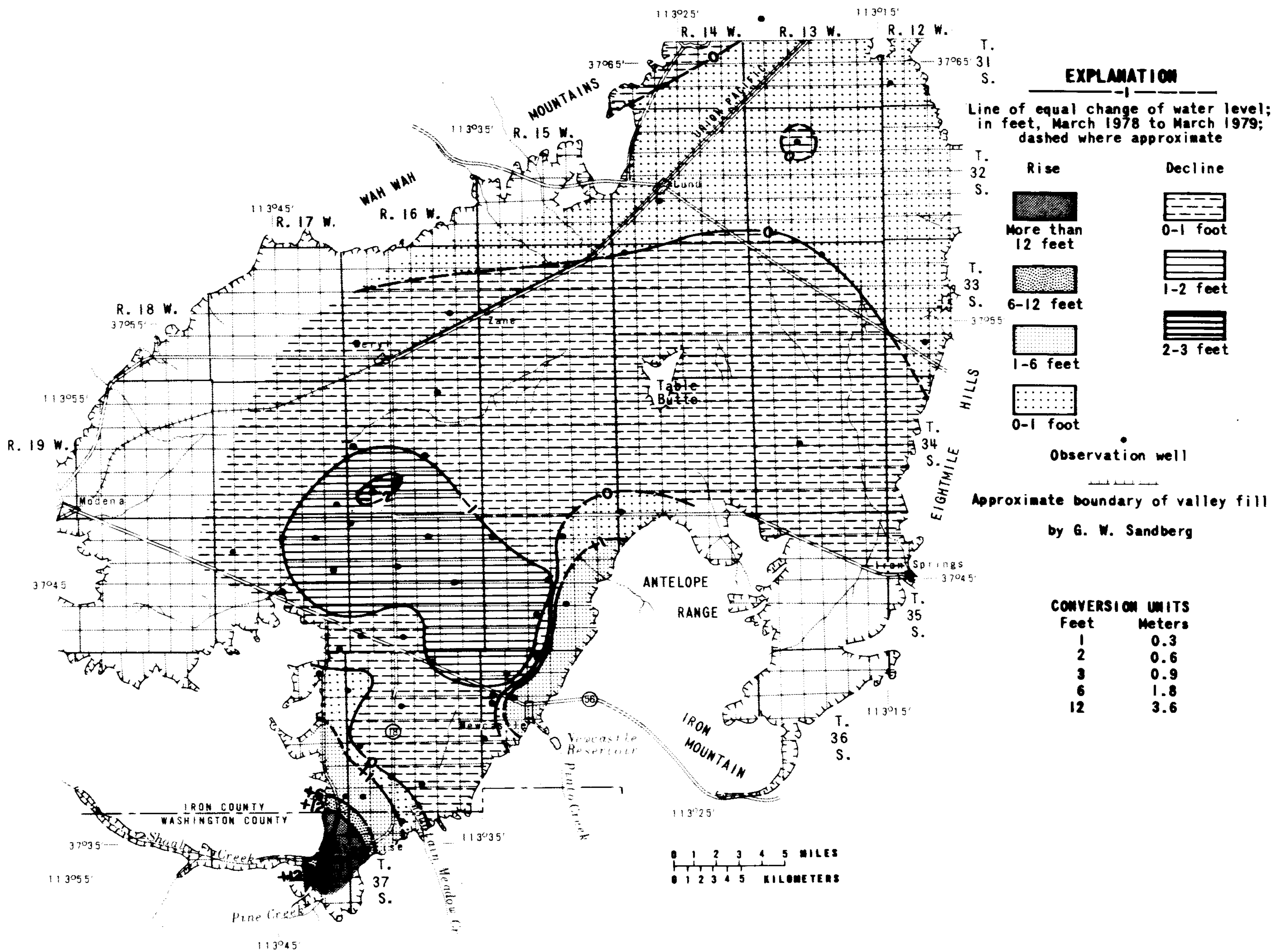

Figure 34.—Map of the Beryl-Enterprise area, Escalante Valley, showing change of water levels from March 1978 to March 1979.

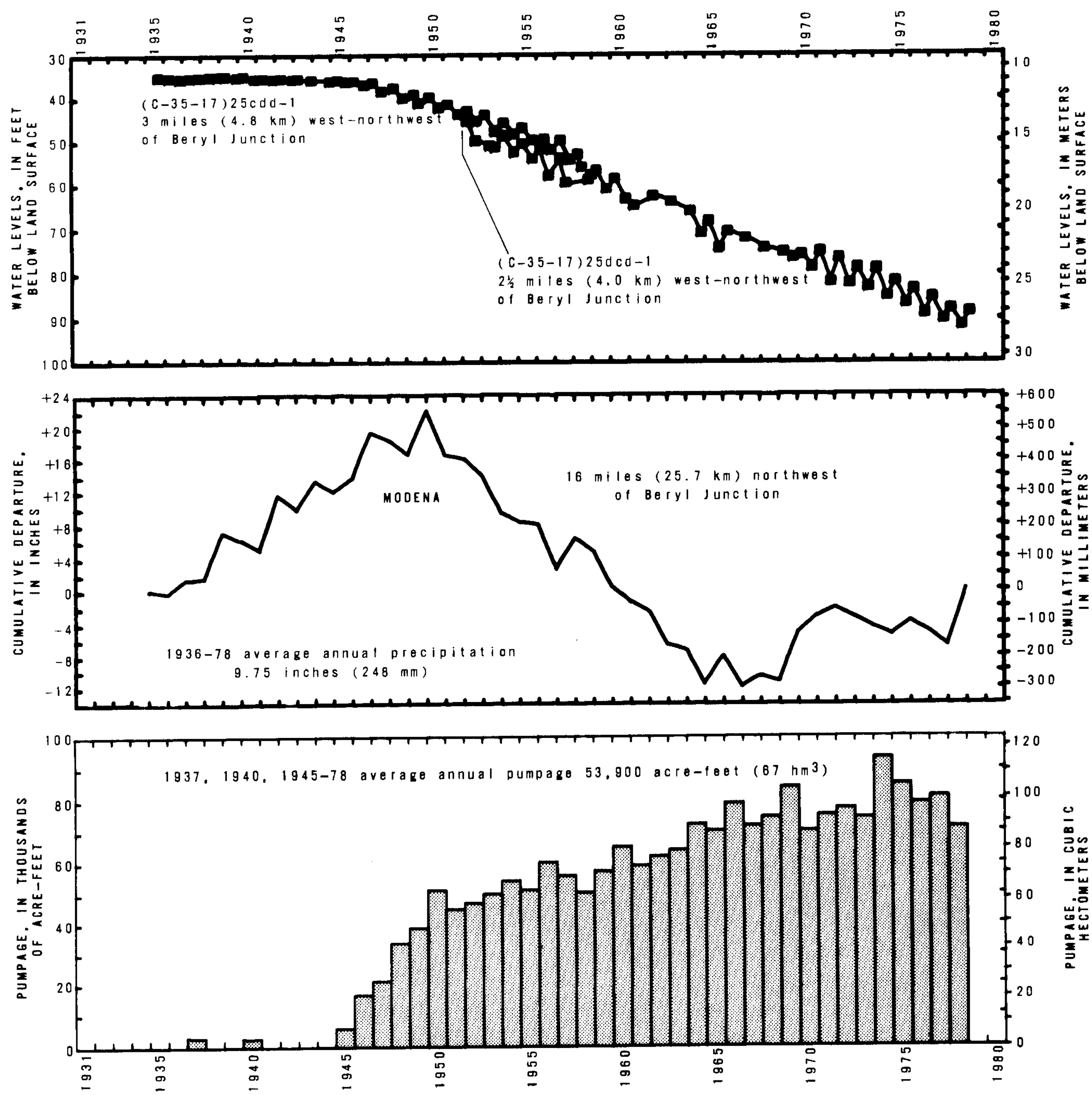

Figure 35.—Relation of water levels in selected wells in the Beryl-Enterprise area, Escalante Valley, to cumulative departure from the average annual precipitation at Modena and to annual pumpage for irrigation.

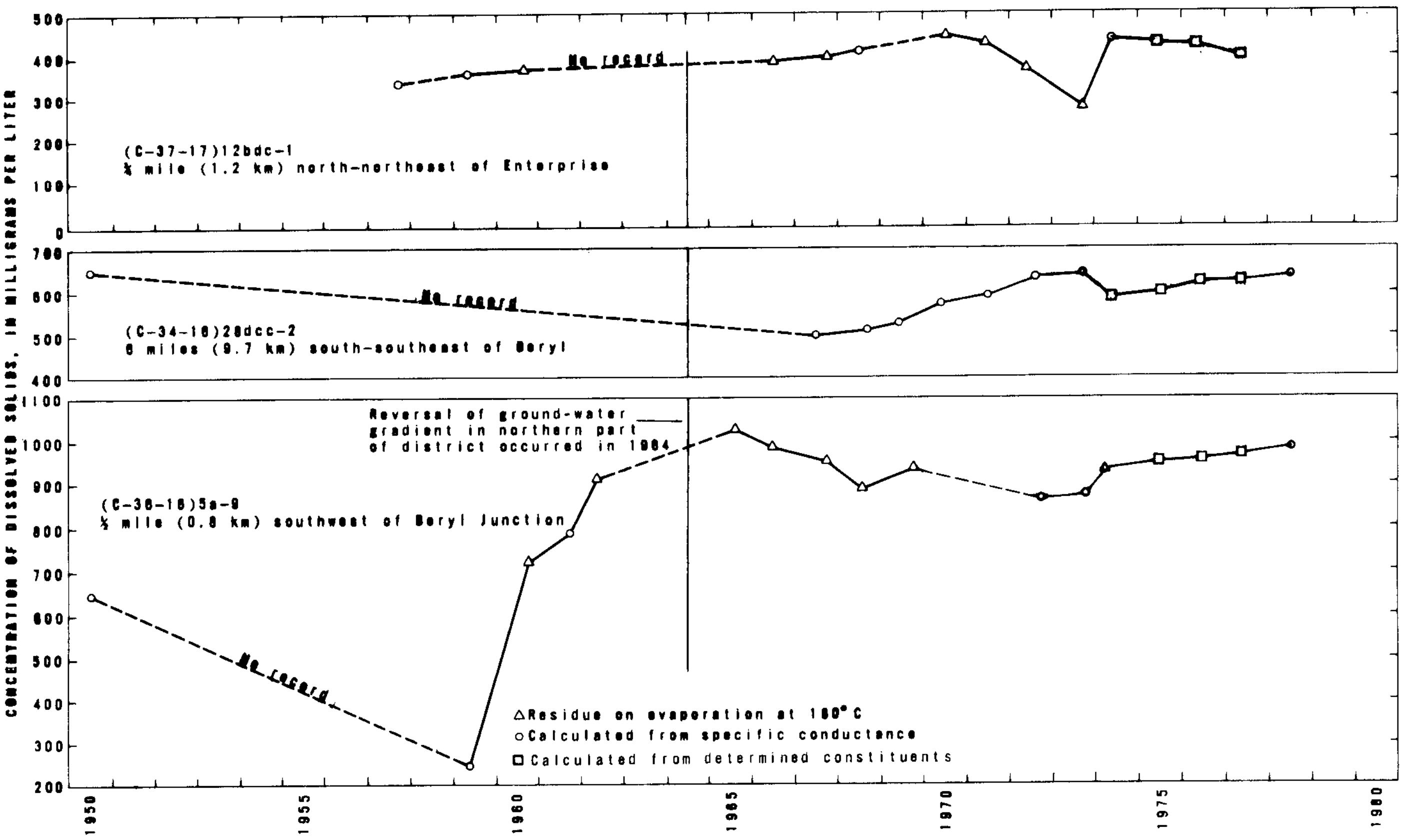

Figure 36.— Concentration of dissolved solids in water from selected wells in the Beryl-Enterprise area, Escalante Valley.

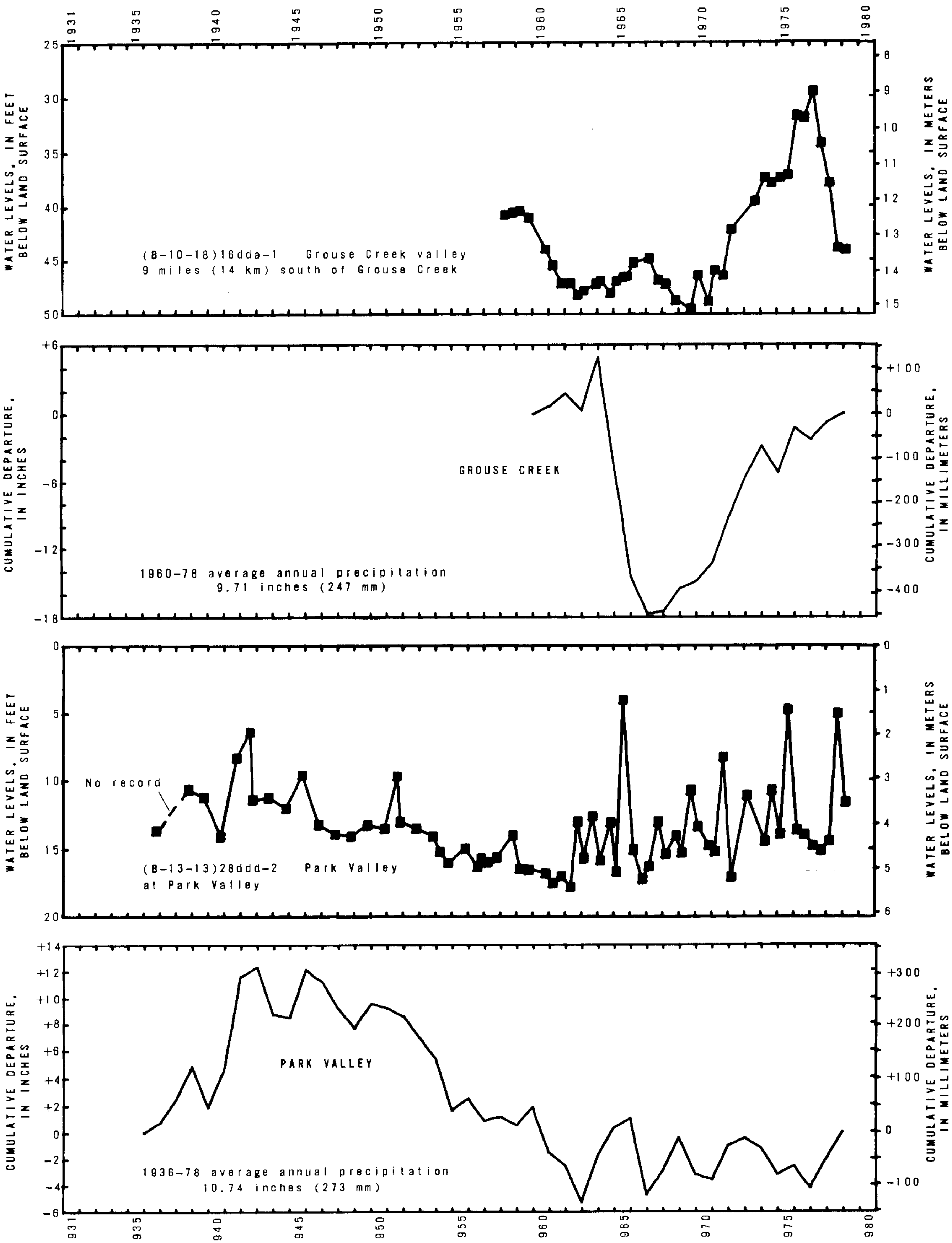

Figure 37.— Relation of water levels in wells in selected areas of Utah to cumulative departure from the average annual precipitation at sites in or near those areas and also total withdrawals from wells in "Other areas."

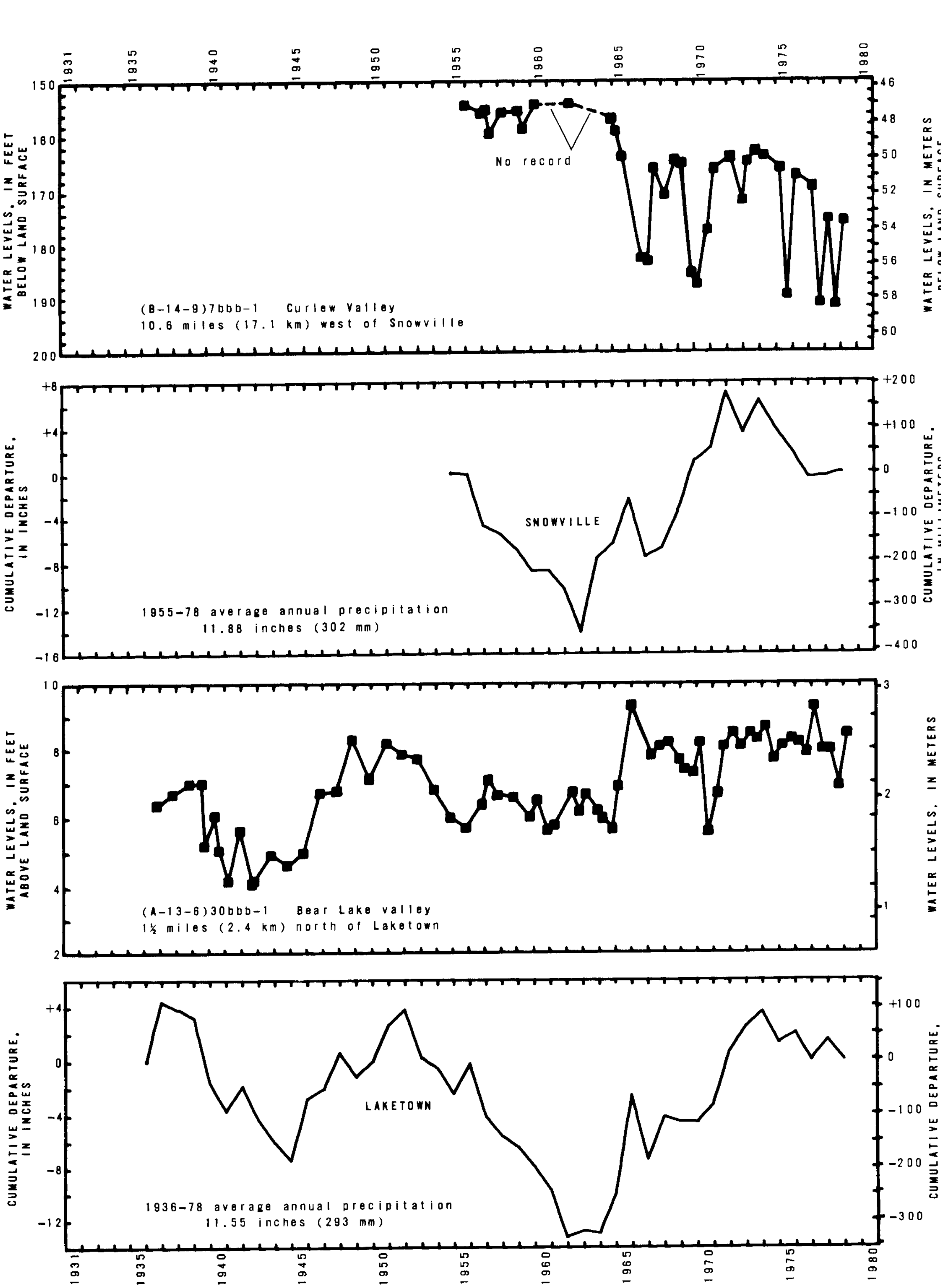

Figure 37.—Continued.

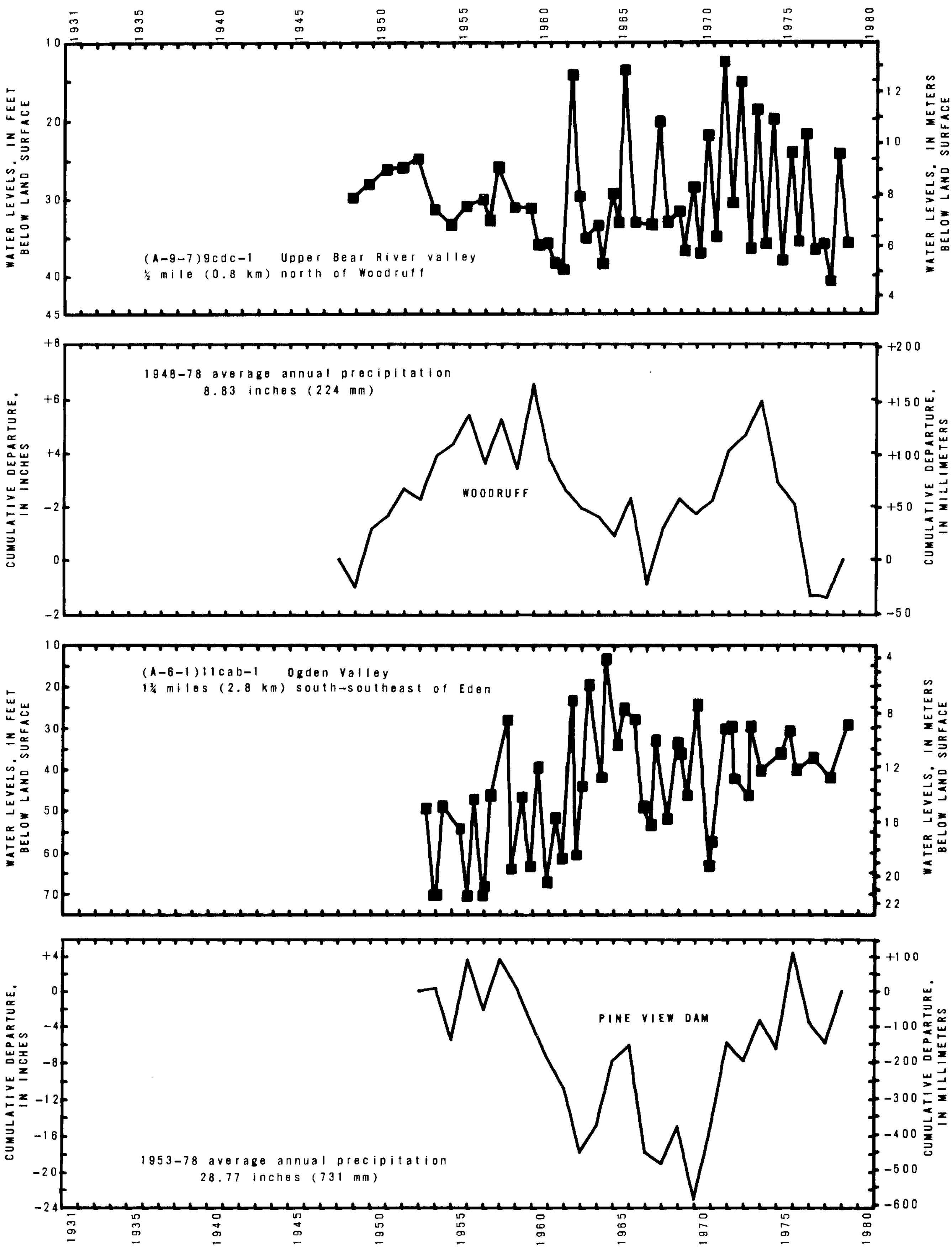

Figure 37.—Continued.

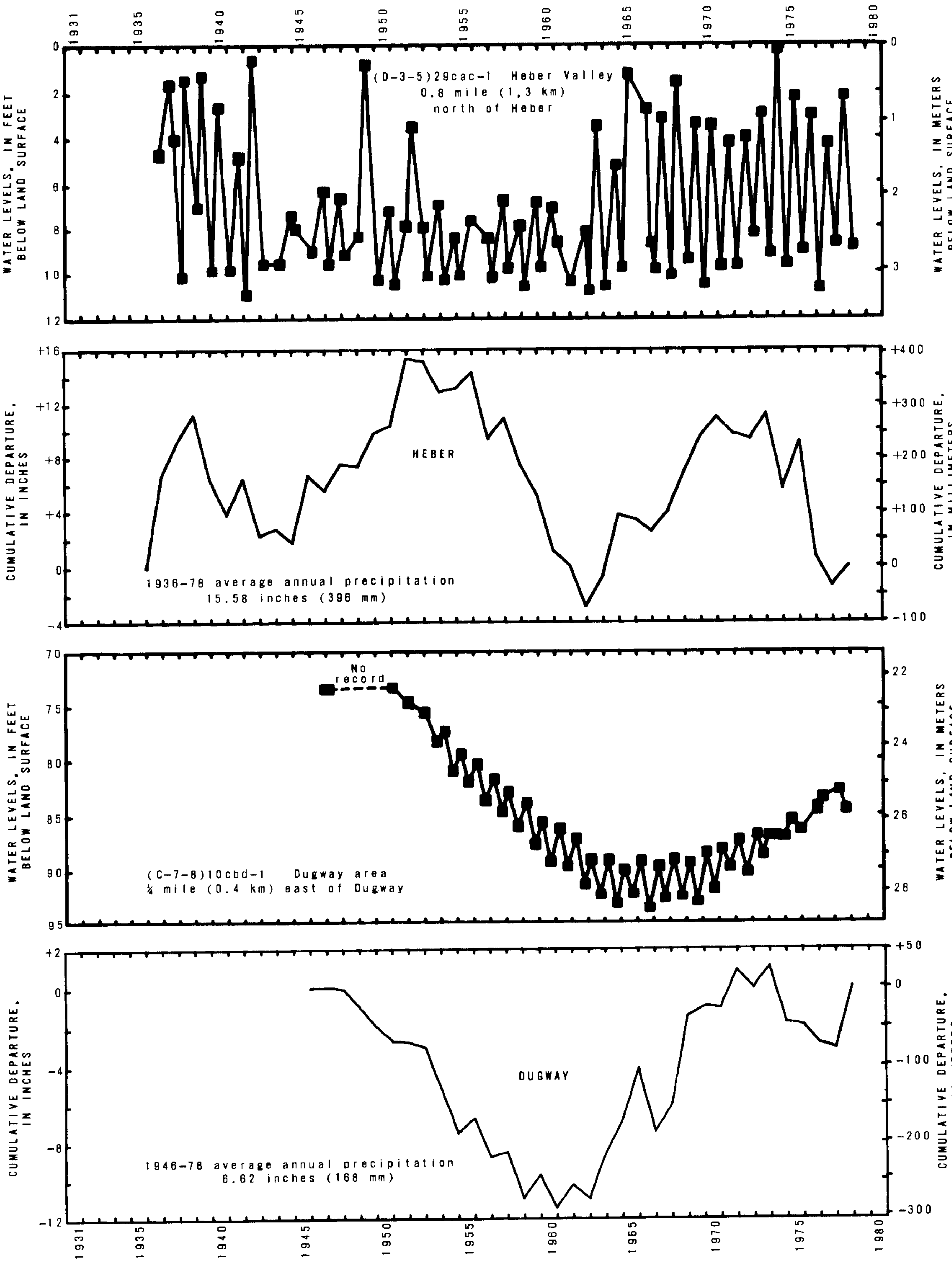

Figure 37.— Continued.

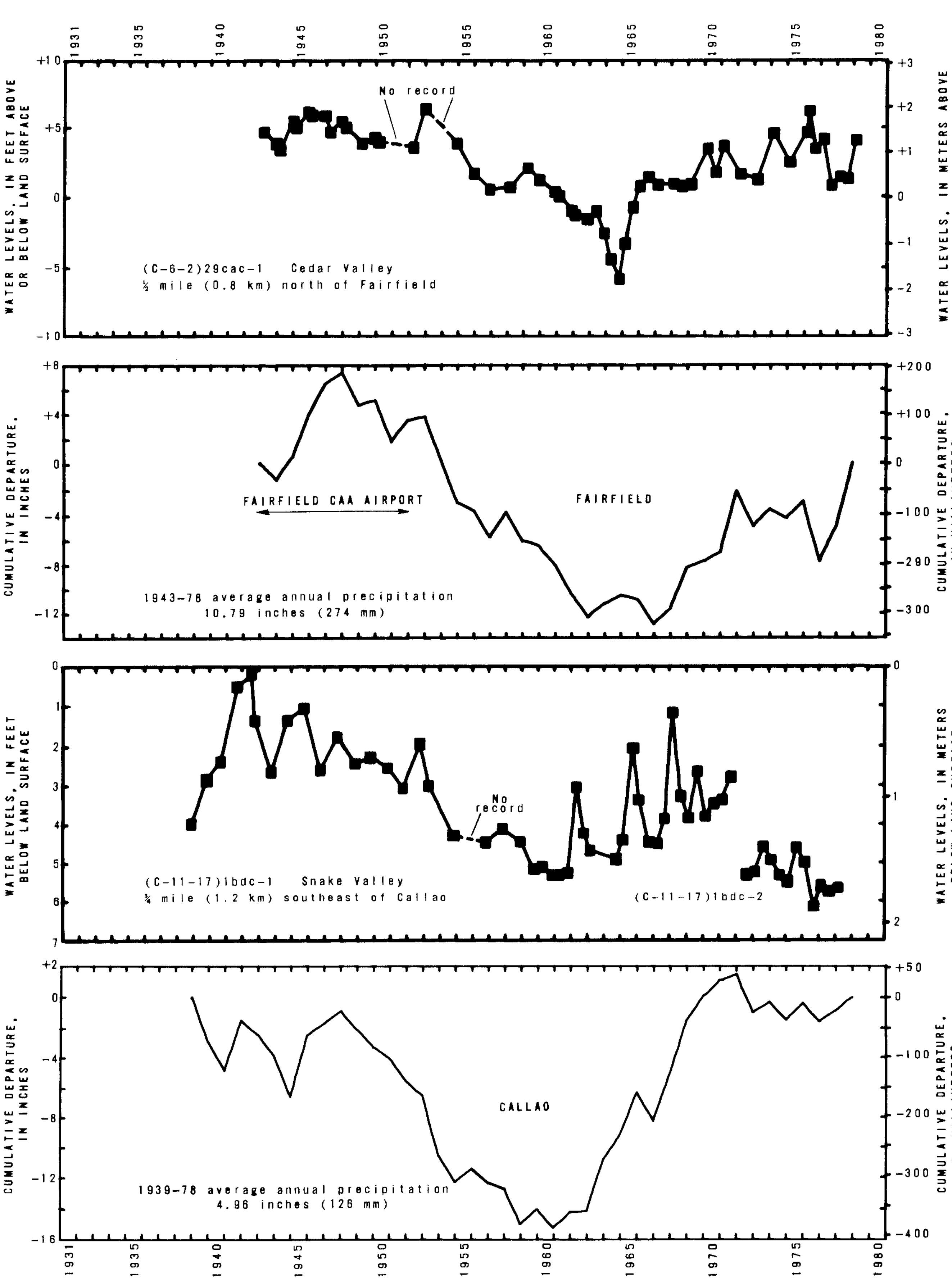

Figure 37.—Continued.

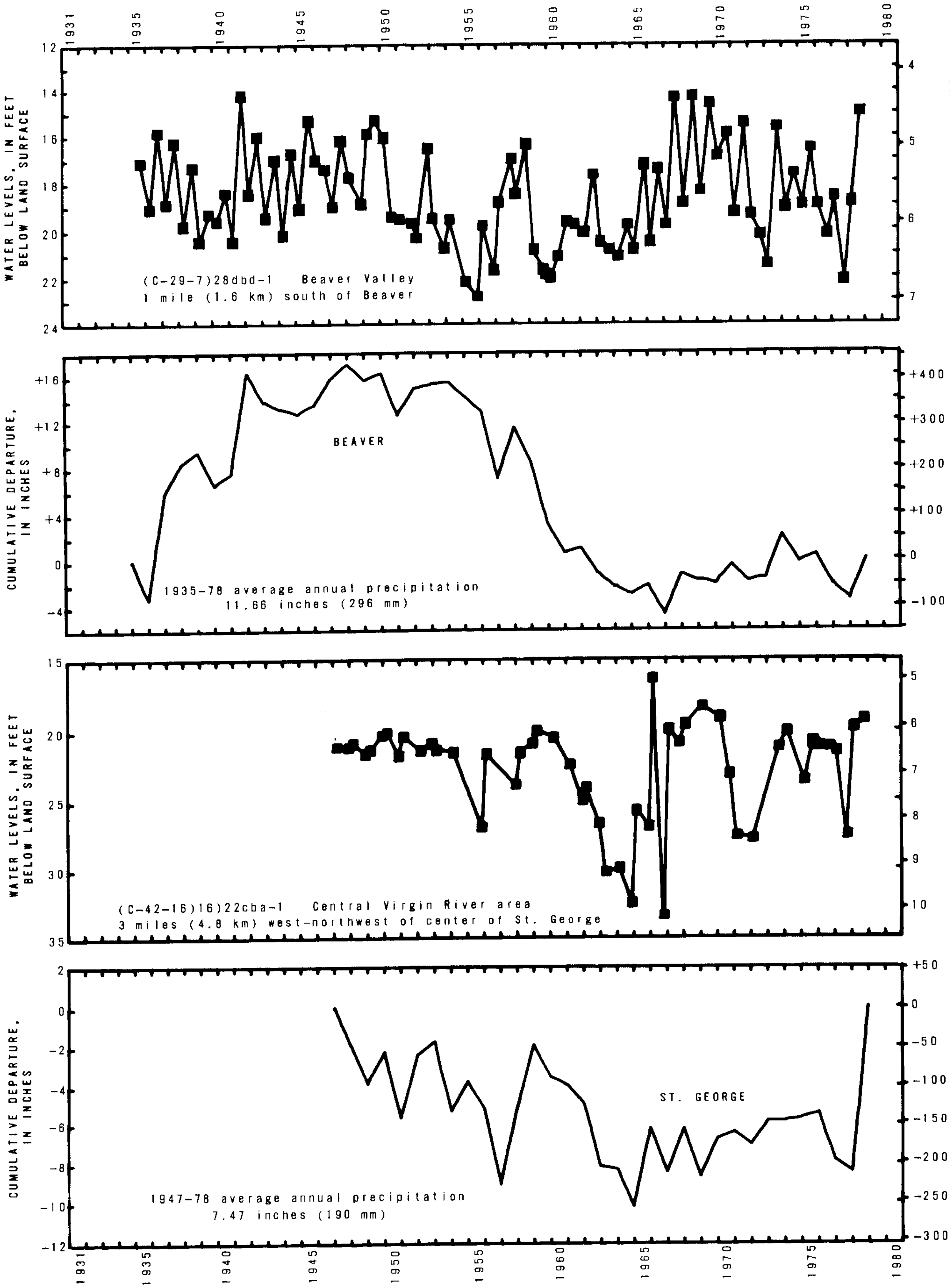

Figure 37.— Continued.

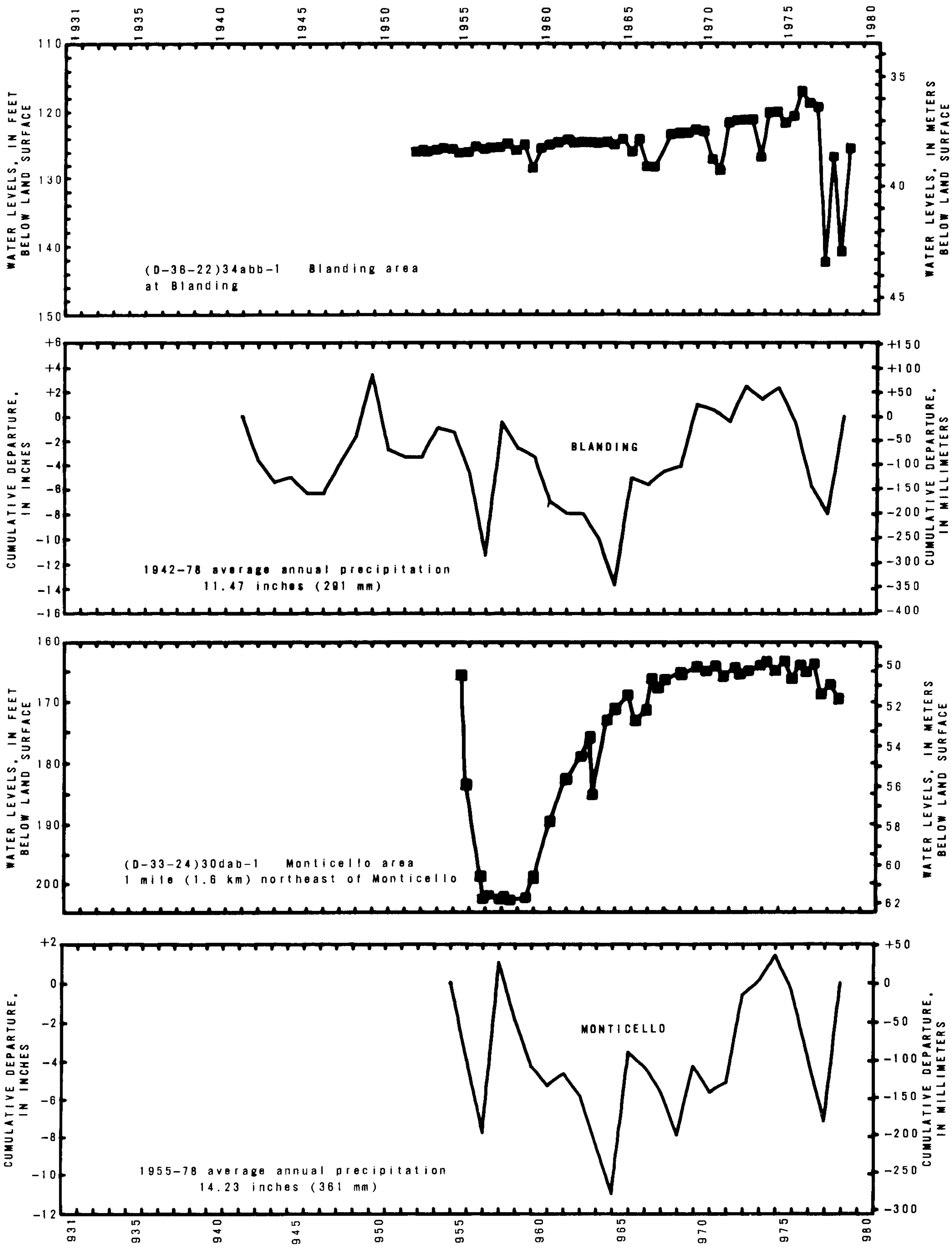

Figure 37.—Continued.

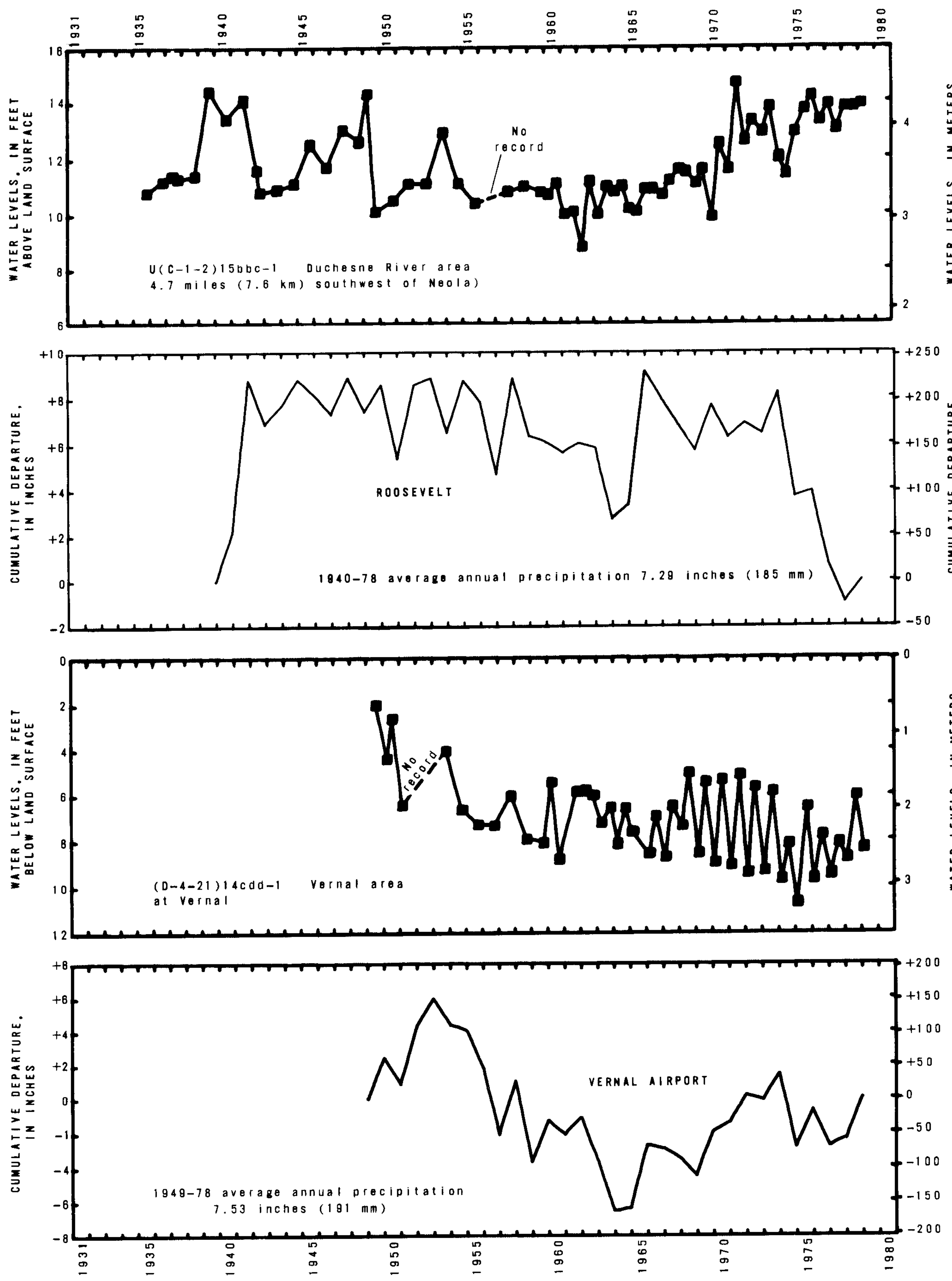

Figure 37.— Continued.

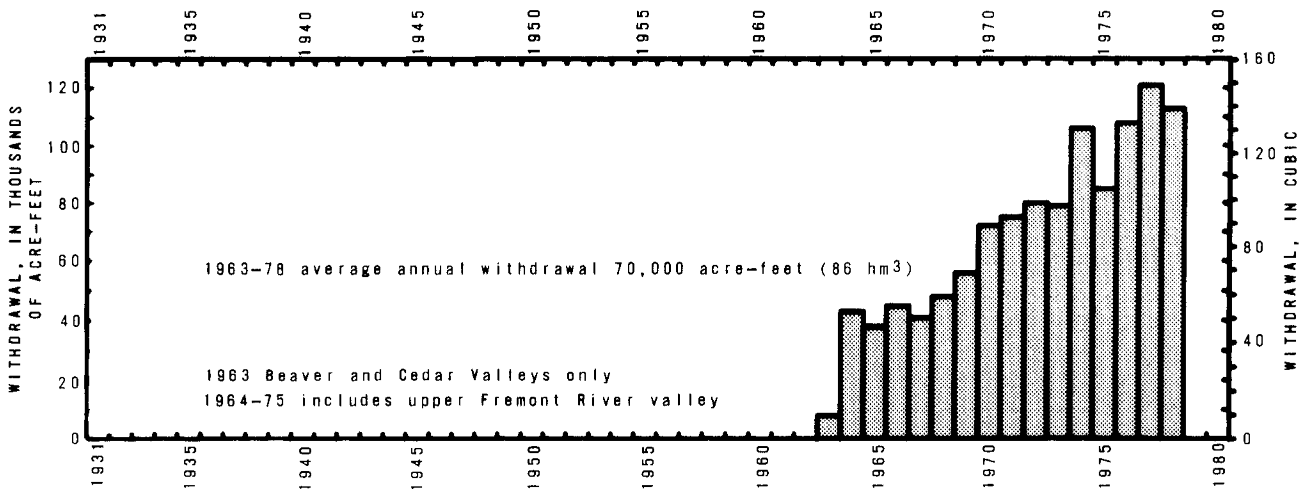

Figure 37.— Continued.